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SPACE VOYAGER

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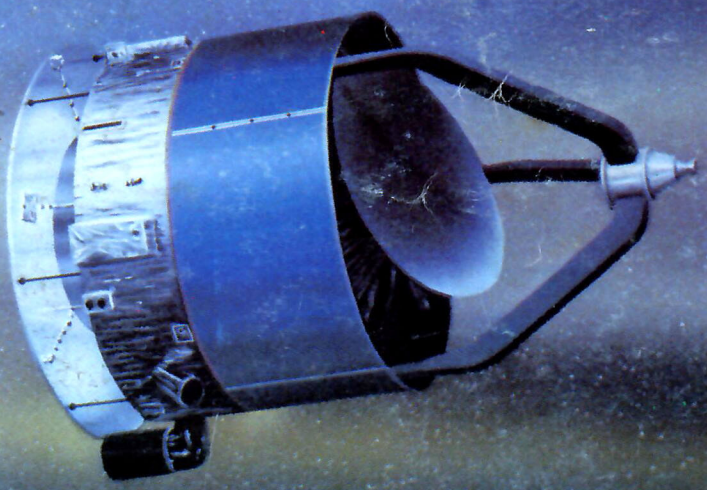

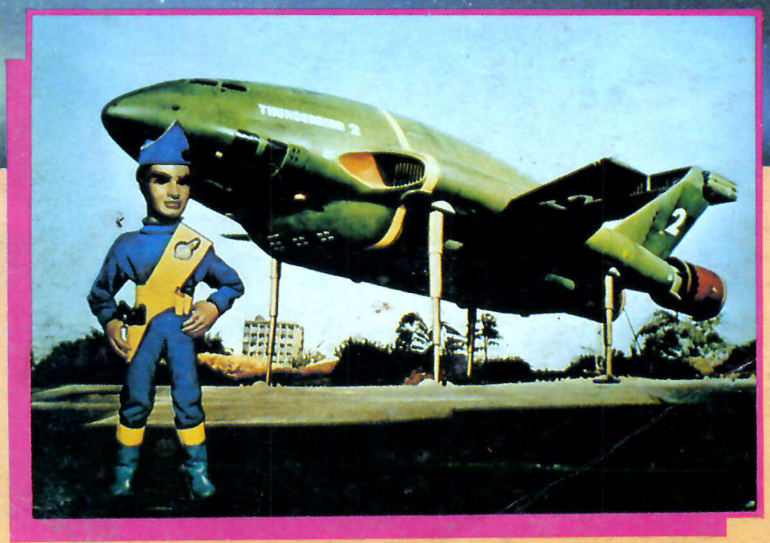

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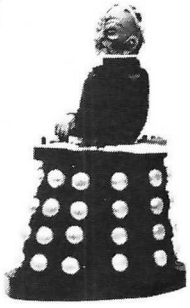

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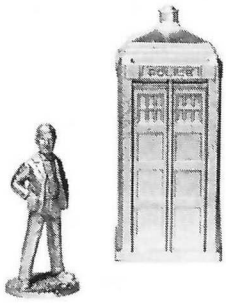

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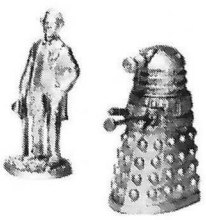

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ISSUE No. 15. JUNE/JULY, 1985 ISSN 0264/2301

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On the cover:
The Giotto *space probe features this issue in* The Comet Returns, *page 14 (painting by Paul Doherty). Inset:* Thunderbirds are Go *on page 32. Back cover:* Thunderbirds *again, Anderson's most famous creation. Inside back: Alan Arkin stars in* The Return of Captain Invincible *with Christopher Lee, reviewed next issue.*

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CAPTAIN'S LOG

This issue your Captain is in high dudgeon. I have not just taken, but swallowed and ingested, a whole mess of umbrage, my indignation is righteous. In short and without the dictionary . . . I am cross.

I'm cross, me personally, and on readers' behalf, with the BBC. I'm cross with them about their 'resting' of *Dr Who* and about their quiet dropping of the present run of *Star Trek* – and not just about the fact of those actions but about the way they were done.

First of all *Star Trek,* which has been dotted about the schedules like measles in its present run is dropped, totally without a word, to make way for Terry Wogan. Not so much as a voice over the week before to say, 'well, it'll be back in the Autumn' or whenever. Nothing.

Then of course came the *Dr Who* news. The 'rest' was blamed on the high cost of *Dr Who* – probably one of the most cost-effective of the BBC's programmes in terms of foreign sales, merchandising of videos and games, plus licensing fees for the books and other spin-off products (on all of which the BBC collects its percentage).

One begins to suspect that someone in the BBC doesn't like science fiction. Well, fair enough, but what right has he to ram that view down everybody's throat?

BBC-1 controller Michael Grade has been quoted as saying that *Dr Who* was only getting six million viewers for this series, against ten or 11 million a few years ago.

Well, is six million so bad? Many BBC programmes attract even smaller audiences – and in fact *Dr Who's* audience is estimated at 110 million worldwide – not a bad audience for a programme which has been running for 22 years. Off-hand I can think of only one other programme which also sells round the world and gets audiences like that and is still going strong after almost as many years . . . *Star Trek.*

Dr Who fans were also dismissed as a special interest group by Mr Grade. *Oh wow.*

We all know that both *Star Trek* and *Dr Who* have had their bad moments and their bad stories – every series has peaks and troughs, but at their best they are able to stand with any drama.

Another reason given for the axing is that the longer episode experiment hasn't worked. 'We've got a lot of work to do on it' said Mr Grade. Bill Cotton, Mr Grade's boss and Managing Director of BBC TV said: 'The 45 minute series has been a good experiment but we need to get back to basics and to established ways . . .'

Fans should be 'a little patient while we get the Doctor back onto familiar rails'. What *do* they mean? Has the Doctor gone off the rails? I've enjoyed the longer episodes without the artificiality of a forced cliff-hanger just as you've settled into watching. A 45-minute episode gives you a chance to really settle into watching – a meat and two veg effect rather than the Chinese meal of the old shorter format. It also allows scriptwriters to develop a story without having to gallop around frenetically towards a 'who's in danger this episode' situation before they've even started to tell the story.

With Colin Baker and Nicola Bryant *Dr Who* has one of the strongest teams for a long time (even my Mum reckons Colin the best Doctor yet!), so what is all this re-thinking? Okay, so maybe some of the stories this season could have been just a touch better – and I could have lived without everyone dying in an outpouring of green slime but on the whole the *Who* team hasn't marked time (no pun intended).

We've had some good stories with good casts and I think the only real groan of the series so far is that dreadful SFX of Halley's Comet on the TARDIS viewscreen plus a certain sloppiness in the start of each story being that the TARDIS has been pulled off course.

All the newspapers knew the import of what the BBC was doing – pages and pages were devoted to the story – and national newspapers don't devote pages and pages to a story unless they think their readers are interested. Many papers carried leading cartoons on the story as well.

Even Terry Wogan's show commented the day after the story broke – a Cyberman came on and announced he was looking for Michael Grade to cybernise him – after all he had advanced the Cyber cause so well by 'getting' the Doctor.

And of course, good old *Spitting Image* has weighed in with a comment about the 'rest' being the main idea from the BBC's Department of Good Ideas.

Of course it is all very reminiscent of what happened to *Blake's 7.*

Someone from the BBC should telephone Paramount. They took their time, but finally realised that good SF *sells.*

This issue

But what do we have for your edification in this issue? Let's see . . . Still with *Dr Who,* veteran *Dr Who* actor Michael Wisher takes us behind the scenes from his times appearing in the series and tells us that playing Davros wasn't exactly easy, and David Nightingale continues his history of Gerry Anderson's work with, this time, coverage of his most popular production ever – *Thunderbirds,* plus others.

Also in SF Neil Gaiman has been scurrying round seeing the latest films for us, and talking of Neil we have 20 copies of his *Ghastly Beyond Belief* to be won. Also on films Randy and Jean-Marc Lofficier report on child-fever in Tinsel Town in their Letter from Hollywood.

On the factual side, John Davies concludes his report on IRAS, and Andy Nimmo concludes his series on careers in space. Patrick Moore not only fills us in on Halley-mania but also takes us with him on his recent trip to South Africa.

Ian Graham has analysed the Soviet Soyuz programme and we've a report on the building of an exciting Amateur Astronomy Centre in the Pennines.

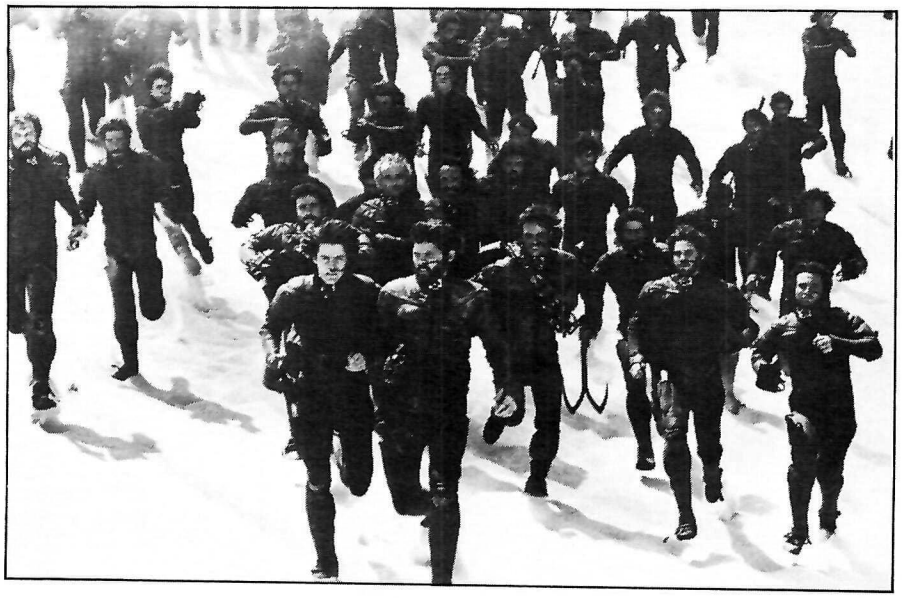
You'll also find a readers survey in this issue – please fill it in and send it back to us. It will help us find out exactly what you want to see in *Space Voyager* in future as well as telling us just who you all are. Postage is paid, so all we ask is a few minutes of your time.

And finally we come, of course to that regular finale to my Log, the Caption Contest.

In issue 13 we had a still from *Blade Runner* showing Ridley Scott and Harrison Ford semi-glowering at each other. Lots of suggestions about ceilings and hairdryers, but I thought the silliest came from Mr A Sill who suggested 'Hold it, Harrison, your cheque's in the post' . . . and haven't we all heard that one before! Mr Sill comes from Old Swan, Liverpool.

For this month's contest we have a shot of the Fremen hoards of Dune charging over the sand, led by Paul Atreides.

Why are all these semi-punks running around? What is happening? You tell us and you could win a year's subscription to *Space Voyager.*



Data Bank

Convention Data
by Chris Chivers

1985

May 23-26 ITALCON XI. SF. Fanano, Italy. Write: Bruno Valle, Via San Pedro 5, 1-16035, Rapallo, Italy.

May 25 DRAGONMEET VII. Fantasy. Central Hall, Westminster, London.

May 25-27 LAZLAR LYRICON. Hitchhikers Guide. Birmingham. Write: Robert Cogger, ZZ9 Plural Z Alpha, 10 Bourne Parade, Bourne Road, Bexley, Kent, DA5 1LQ.

June 8-10 CON AMORE. Star Trek. Brisbane, Australia. Guests: David Gerrold, Susan Clarke and Dennis Stocks. Write: Con Amore, PO Box 231, Cannon Hill, Queensland 4170, Australia.

June 8 THE UNIVERSAL MODELLING SHOW '85. Birmingham. Write: Malcolm Hilton, 131 Priory Road, Hall Green, Birmingham, B28 0TG.

July 6-7 NASACON VI. SF. Stockholm, Sweden. Write: Lottie Eriksson, Maskinistgatan 98b, S-117 47 Stockholm, Sweden.

July 11-14 THE FIRST BRENTFORD INTERNATIONAL FESTIVAL OF SF AND FANTASY. London. Write: Robert Rankin, 20 Bassett Road, London W10.

July 12-14 TRIPLE S CON. Space/SF. Cardiff. Guests: Lord Young of Dartington, Wendy Graham, Michael Wisher and Duncan Lunan. Write: Iain Thomas, 162 Kingsheath Avenue, Rutherglen, Glasgow, Scotland.

July 13-14 YORKSHIRE SCALE MODELLING WEEKEND. Ripon. Write: R. Thorn, 22 Chatsworth Place, Harrogate, West Yorkshire.

July 19-22 ALBACON '85. SF. Glasgow. Guests: Harlan Ellison, Anne McCaffrey. Write: 20 Hillingdon Gdns, Cardonald, Glasgow, G52 2TP.

July 26-28 BECCON '85. SF. Guests: Richard Cowper. Write: 191 The Heights, Northolt, Middx.

Aug 15-18 SWECON '85. SF. Sweden. Guests: Chris Priest, Lise Tuttle. Write: A. Engholm, Maskinistgaten 98b, S-117 47 Stockholm, Sweden.

Aug 22-26 AUSSIECON II. 43rd World SF Con. Melbourne, Australia. Guests: Gene Wolfe and Ted White. Write: Joseph Nicholas, 22 Denbigh Street, Pimlico, London, SW1V 2ER.

Aug 23-26 ENTERPRISE I. Star Trek. Liverpool. Guests: James Doohan, John Shackley. Write: Sharon Rowe, 24 Haywards Close, Clevedon, Avon.

Aug 24-25 LEISUREHIVE 2. Dr Who. Swindon. Write (do not phone): Tony Cherrington, 2 Domestic Quarters, Bryanston School, Blandford, Dorset DT11 0PX. (Postponed from Aug 3-4).

Sept 6-8 FANTASYCON X. Fantasy. Birmingham. MC: Charles L Grant. Write: Steven Jones/Jo Fletcher, 130 Park View, Wembley, Middx. HA9 6JU.

Sept 13-15 CAMCON (UNICON 6). SF. Cambridge. Write: N. Taylor, c/o Perspective Design Ltd, 9 Pembroke St, Cambridge, CB2 3QY.

Sept 20-22 DELTACON '85. Star Trek. Baton Rouge, USA. Guests: DeForest Kelley, Walter Koenig, Walter Irwin. Write: Deltacon, 12529 Cate Avenue, Baton Rouge, Louisiana 70815, USA.

Sept 28-29 GAMES DAY '85. Sci-Fi/Fantasy. Festival of indoor games and live combat from Treasure Trap. Horticultural Hall, Greycoat St. London.

Oct 11-13 MIDCON '85. Star Trek. Leicester. Guest: DeForest Kelley. Write: Terry Elson, 8 Ennerdale Close, Oadby, Leicester, LE2 4TN.

Oct 26-27 BENELUXCON 85. SF. Leiden, The Netherlands. Guest: AnneMarie van Ewyck. Write: Roelof Goudriaan, Postbus 1189, 8200 BD Lelystad, The Netherlands.

Nov 1-3 NOVACON 15. SF. Coventry. Guests: Dave Langford and James White. Write: Graham Poole, 86 Berwood Farm Road, Wylde Green, Sutton Coldfield, West Midlands, B72 1AG.

Nov 1-3 CYMRUCON 85. SF. Cardiff. Write: Neil Burgess, 99 Coed Edeyrn, Llanedeyrn, Cardiff, Wales.

1986

May 2-5 UFP CON '86. Star Trek. Birmingham. Guest: David Gerold. Write: Kim Knight, 30 Woodcote House, Queen St., Hitchin, Herts.

Aug 28-1 Sept CONFEDERATION 44 WORLD SF CON. Atlanta, USA. Guests: Ray Bradbury, Terry Carr and Bob Shaw. Write: Confederation, 2500 N Atlanta Street, Smyrna, Georgia 30080, USA.

(Readers should always enclose an SAE or IRC when contacting con organisers for details, please).

Space Voyager is hoping to compile and maintain a record of all SF cons round the world, for the benefit of all our readers. We may not publish details of every one, simply because there isn't space, but readers with travel plans will be able to find out about any cons and make arrangements to attend while abroad.

Readers – and especially con organisers from out of Britain – can get into the diary by sending details to Chris Chivers at the editorial address.

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Greenfingers in Space

Four girls have beaten the boys into space with an experiment which will be used on board the Space Shuttle.

The girls, from Ashford boarding school in Kent, want to see how a chemical garden will grow without gravity.

Their entry beat five other finalists in a competition sponsored by ITN and Space Services International.

Other experiments had included the study of earthworms, mushrooms and peanuts in space.

The girls' experiment will earn a permanent place in the Space Gallery at the Science Museum after the Shuttle mission.

Winners

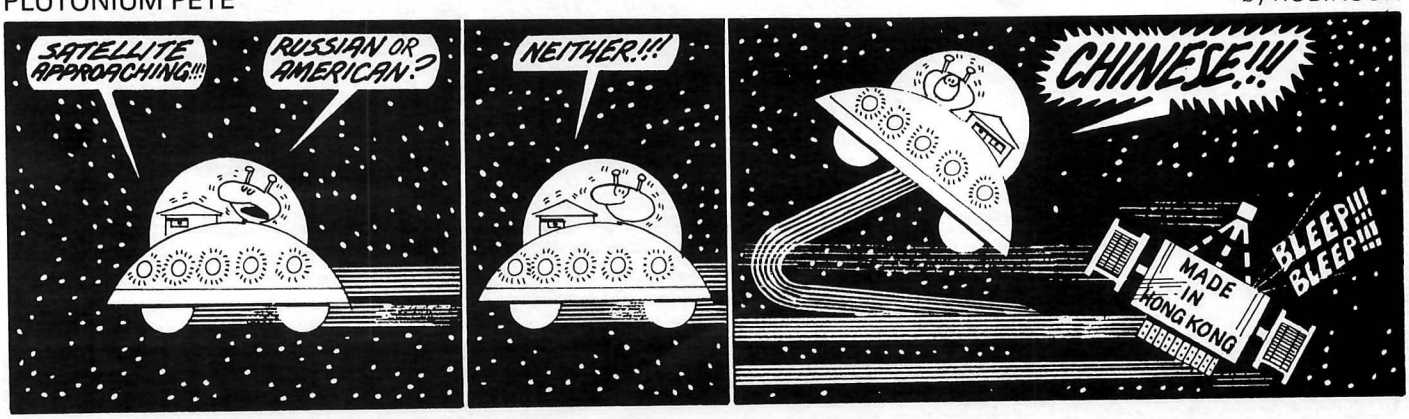
Lots of entries for all our competitions this time – we didn't keep a count but they could have been weighed more easily than counted!

First result is for the book competition:

1 – where did Douglas Adams find the name for his character Hotblack Desiato? – It is the name of a North London estate agent firm.

2 – How long did Dee Robson have to design the costumes for *Hitchhikers Guide to the Galaxy?* – Six weeks.

PLUTONIUM PETE by ROBINSON



Data Bank

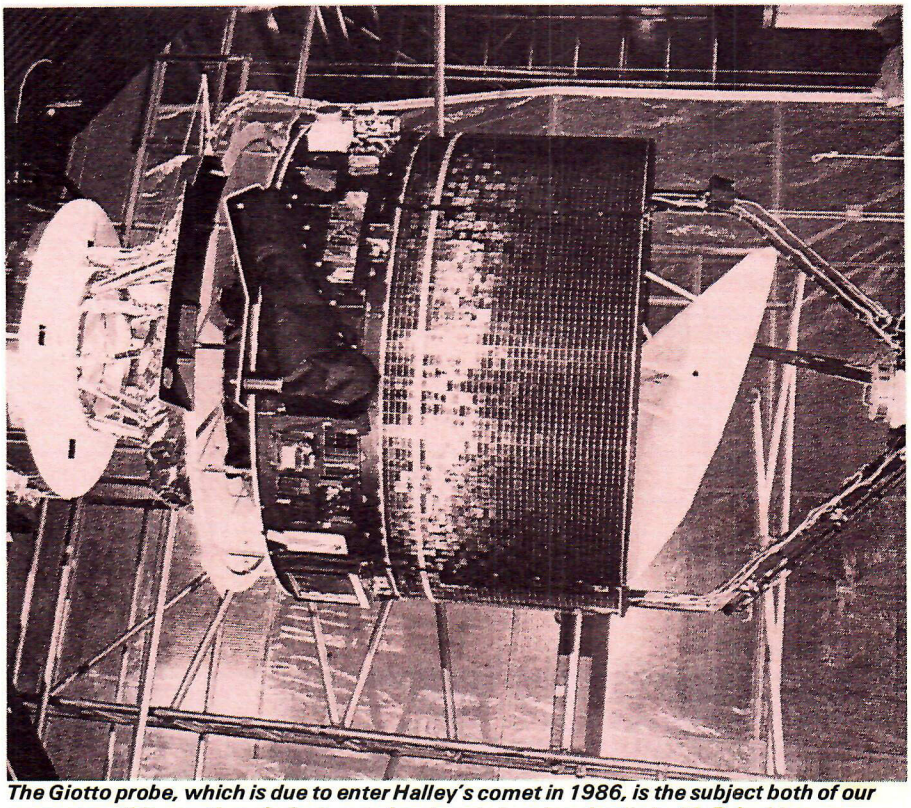
3 – How was actor George Takei connected with the Olympic Games held last summer? He carried the torch and also arranged for *Star Trek* fans to carry it in other towns.
4 – When will Engineer Scott – actor James Doohan – next be in Britain – and where? – August 23-26 at Liverpool (at Enterprisel).
5 – Who suspects that there is a tenth planet in the Solar System? – Patrick Moore.
6 – Which actress helped Sally Ride into space? – Nichelle Nichols – Uhura in *Star Trek.*

And the winner is . . . Stanley Roberts, of Bethnal Green, London.

The second competition competition had three sets of *Star Trek the Role Playing Game* as prizes.
Questions were:
1 How many episodes of *Star Trek* were made for TV? – we allowed either 78 or 79, depending on how you count *The Menagerie.*
2 Who created *Star Trek*? Gene Roddenberry.
3 – Which two roles did Leonard Nimoy play in the film *Star Trek III the Search for Spock*? He was Spock and also Director.
4 – In which century is *Star Trek* set? – 23rd.
5 – What colour is Spock's blood? – Green.
6 How long was the mission of the USS Enterprise due to last? – Five years.
7 – Where is the headquarters of Starfleet? – Earth (San Francisco).
8 – Name any five characters from the TV series who also appeared in *Star Trek the Motion Picture* – Kirk, McCoy, Spock, Sulu, Scotty, Uhura, Chekov, Chapel, Rand (and – sort of – Mark Leonard).

And the three winners are . . . Miss S Clark, Radcliff, near Manchester; Tony Bayliss, Fitton Hill, Oldham and Ronald Beaton of Greenock, Scotland.

The cast line-up from 'Star Trek – the Movie', including nine 'originals'. From left: Sulu, Scotty, Rand, Uhura, Decker, McCoy, Chapel, Kirk, Spock, Ilea and Checkov.



The Giotto probe, which is due to enter Halley's comet in 1986, is the subject both of our cover story this month and a lecture to be given in London shortly by Mr R Jenkins.

Giotto lecture

Mr R Jenkins will be giving a lecture at The Royal Aeronautical Society, 4 Hamilton Place, London, W1, entitled 'The Giotto Mission and Spacecraft', on Tuesday May 21, at 6 pm. No tickets are required – and admission is free.

Galileo changes

NASA have announced an important change to the flight plan for the Galileo mission to Jupiter. The original proposal called for the probe to pass no closer than a few million kilometres to any of the catalogued asteroids. However, mission planners have found that the spacecraft can be re-directed to pass within 10,000 to 20,000 km of the asteroid 29 Amphitrite in December 1986.

Galileo is scheduled to be launched by Space Shuttle in 1986.

After launch from the Shuttle and once its systems have been checked, Galileo's Centaur booster will fire and put Galileo on course for Jupiter.

The asteroid flyby is not regarded as a primary mission objective and will not be allowed to jeopardise the mission to Jupiter. For that reason, the final decision whether or not to include the asteroid flyby will only be taken after launch. The decision will be based on the health of the spacecraft and the diversion to Amphitrite will only be made if Galileo's systems are working properly.

Amphitrite was discovered by Albert Marth at the William Bishop Observatory, London, in 1854. It was the 29th asteroid to be discovered and is the 12th brightest when seen from Earth. It is one of the largest with a diameter of about 200 km.

Changes in brightness indicate that Amphitrite may have a rotation period of 5.39 hours. If this is correct, Galileo should be able to photograph most of its surface.

The diversion to Amphitrite will delay Galileo's arrival at Jupiter by more than three months. The spacecraft is now due to arrive on December 10, 1988.

Data Bank

Satellite order

The Space and Communications Division of British Aerospace, leading an international team of space contractors, has been selected by Inmarsat to enter into negotiations for the supply of second generation satellites for its global maritime communications network.

Inmarsat has announced that, contingent upon satisfactory negotiations, the initial order will be for three satellites, currently worth in the region of US $160 million. The contract could also carry options for up to six additional satellites, bringing its total value to more than $400 million, at current prices. BAe will have some 34% of the work with the remaining going to companies in the United States, France, Germany, Holland and Italy.

CHINESE NEWS

Poetry in Orbit

Have you ever noticed how boring the names of satellites can be? Take weather satellites for example. Two particularly tedious examples are the American spacecraft called GOES (Geostationary Orbital Environmental Satellite) and NOAA (National Oceanic and Atmospheric Administration).

Now the Chinese are set to make the skies much more interesting. Their first weather satellite will be called Windy Cloud 1.

Databank compiled this issue by:
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Anniversary of China's first COMSAT

On April 16 the first Chinese communications satellite completed its first year of operations successfully, with no signs that its operational life was coming to an end.

Known in the west as PRC-15, the satellite was launched on 8th April 1984 at 11.20 GMT into a 31 degree, 413-35,688 km transfer orbit and on 10th April at 00.41 the orbit was raised to 35,521-36,383 km, inclined at 0.72 degrees to the equator. This orbit had a period of 1,444.5 minutes, which allowed the satellite to drift westwards from its injection position over 143 degrees E to its operational position near 125 degrees E. The orbit was adjusted on 16 April at 10.28 to the operational 0.75 degrees, 35,777-35,790 km orbit.

The satellite has a mass of 420 kg on station and is cylindrical with antennae on the top. The mission was the first Chinese attempt to place a satellite into a geostationary orbit, and considering the low-key approach taken in the Chinese space programme it is a significant achievement. The launch vehicle was the Long March 3, and the launch came from the new site in Szechwan Province introduced in January 1984.

The satellite operations during 1984-1985 have been interesting to monitor. Due to irregularities in the Earth's gravitational field, and the influences of the Sun and Moon, the satellite if left to itself will drift off station. The orbital period is initially set just below 1,436 minutes, so that relative to the Earth the satellite will drive slightly eastwards, but as the orbit is perturbed the orbital period increases and the satellite begins to drift westwards when the period exceeds 1,436 minutes. To control the satellite's position, orbital adjustments are made every 6-12 weeks, and these are brought out in Figure 2.

Analysts will know when the satellite has stopped operating, since orbital corrections will cease. In the meantime, western observers are awaiting the launches of China's first meteorological satellite and a second communications satellite, the latter to be located over 70 degrees E.

JAPANESE NEWS

Third nation

Japan became the third nation to send a probe into interplanetary space when the Sakigake spacecraft was launched on January 8. The probe was launched from the Japanese Institute of Space and Astronautical Science site at Uchinoura in south-west Japan and is now on course for Halley's Comet.

Sakigake means 'Pioneer' and the spacecraft is paving the way for the launch of the more sophisticated Planet-A in August.

The two Japanese probes are part of an international attempt to study Halley's Comet during its fourth predicted return. The Soviet Union has already launched the two Vega spacecraft and the European Giotto probe will be launched from Kourou in July.

Co-operation

Two communications satellites are to be produced jointly by Japan and the USA. Ford Aerospace and Mitsubishi Electric will co-operate on the design and production of a 500 kg-class and a 1,000 kg-class satellite. Mitsubishi will be the prime contractor for the smaller class, with Ford majoring on the larger.

Overseas marketing of the two designs will be handled jointly, though Mitsubishi will handle the home market on their own.

In the past, the two companies co-operated on the CS and CS-2a/b comsats launched in February and August of 1983 respectively.

Japan enters deep space

MS-T5, Japan's first deep-space probe, was launched from Tanegashima on January 8. The probe is designed to test deep-space communciations, and observe the solar wind and magnetic fields, prior to a flyby of Halley's comet at a distance of some 15 million kilometres. The flyby, scheduled for March 1986, will act as a pathfinder for a second Japanese Halley probe, Planet A. Planet A will be launched later in the year.

NASA NEWS

Planet search

NASA's Ames Research Centre and the University of Arizona have signed an agreement to co-operate in a search for planets around other stars. The programme involves the development of an 'orbiting Astrometric Telescope Facility' to be mounted on NASA's planned space station in the 1990s.

What is an astrometric telescope? – it

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measures with great precision the positions of celestial objects such as stars. The object is to detect the wobble in a star's position caused by it being pulled out of position by an orbiting body. The Earth (and all the other planets in the Solar System) influence our Sun in the same way. Although we talk about a planet orbiting a star, in fact they orbit each other, but the star's massive size compared to the planet means that it is moved very little by the planet's gravitational pull. In our own star system, the Sun's motion is influenced most by Jupiter, which pulls the Sun back and forth a million miles every 12 years as it orbits.

The wobble-measuring (astrometric) technique is commonly used with ground-based telescopes to study the wobble caused by two stars orbiting one another. However, detecting the much tinier wobble caused by orbiting planets is beyond the capabilities of current ground-based telescopes. Hence the need to use an instrument in space. The accuracy required is comparable to trying to measure the size of a piece of blackboard chalk sitting on the moon's surface, a quarter of a million miles away.

Canadian Contract

A $1.5 million contract has been awarded to the Canadian company Spar Aerospace for a study of possible collaboration in the NASA Space Station project. A second contract, worth $2.5 million has been awarded for development work on a computerised TV system for NASA's Orbiters.

International Rescue

A young Belgian racing driver and his partner owe their lives to the eye in the sky.

Serge Goriely and co-driver, Philippe Raymakers, were taking part in a 35,000 mile race from Cape Town, South Africa, to Tierra Del Fuego, Argentina – from the southernmost tip of Africa to the southernmost tip of South America. Their four-wheel Citroen turned over several times in a remote part of Somalia. Goriely was thrown out of the car and suffered a fractured skull, but there were no communications or medical facilities within reach.

The team's outlook would have been bleak if they had not been carrying an advanced experimental radio beacon. It transmitted an international distress signal, which was picked up by the American NOAA-9 weather satellite and later by the Soviet COSPAS-1 satellite. The NOAA-9 signal was picked up by National Oceanic and Atmospheric Administration (NOAA) ground station at Wallops Island, Virginia. The data was analysed at NOAA's Suitland, Maryland, facility and forwarded to the Air Force Mission Control Centre at Scott Air Force Base, Illinois. From there, a signal was sent to search and rescue authorities in Toulouse, France, and they informed French diplomats in Africa, who dispatched a doctor by air to the racing team.

This sort of satellite-based international distress network has been in operation since September 1982.

More than 350 persons have been rescued thanks to the international space search and rescue system – taking part in the project are the USA, USSR, Canada and France.

The third Soviet ground station for the reception of emergency information has been prepared for permanent operation in the Pacific port of Vladivostok. Similar stations are already in operation in Moscow and in the port of Arkhangelsk in the north.

The Cospas/Sarsat system has been in operation since 1982 with the use of three Soviet and one American communication satellites plus radio buoys on board sea-going ships and planes. There is also a network of ground stations. Another American satellite is due to be launched in May.

The system of first aid from outer space is to become fully operational by 1990. Yet positive results of international cooperation in this humanitarian field are already at hand. Accidents of more than 100 ships and planes have been registered by means of +Cospas+ – +Sarsat+. Chiefly small fishing boats, private yachts and planes, which go out to sea or take off in any weather, with a crew not always professionally trained to combat the elements, got into accidents so far. The outer space rescue system is open to any state, without any restrictions, Atserov stressed. Britain, Norway, Bulgaria and Finland have gradually joined in it, Denmark and Brazil have also expressed the wish to join. Interest in the system has been displayed by Austria, Argentina, Venezuela and other countries.

SOVIET NEWS

Vega working

First telemetric information which came from Vega, which set off for the planet Venus on December 21 has been analysed.

It will take Vega-2 176 days to fly the Earth-Venus route. Over the period it will cover a distance of 485 million kilometres.

On June 15, 1985 the descent vehicle of the station will reach the surface of Venus to make analysis of the rock.

Soviet, Hungarian and French scientists have designed an original television complex to take pictures of the planet.

Vega will drop an aerostat-containing descent module to study Venusian surface and the atmosphere.

The balloon will be used to study the movements of the cloud cover of Venus, the pressure, temperature and particle characteristics of Venusian clouds.

Balloon probing is a promising method of studying planets in the Solar system. A balloon laboratory does not require special energy spending, which extends its service life.

The aerostat will first be put in the night side of Venus and then will, together with the clouds, move to its morning side. It will travel conducting research for at least 24 hours, or even more. It will be followed simultaneously by long-range space communication stations in Moscow, Ussuriisk in the Soviet Far East, and in the Crimea. When Venus goes beyond our field of vision, foreign observatories will take over.

Halley spotted

Photos of Halley's Comet have been taken by scientists of the Soviet Republic of Kazakhstan at a new observatory in the Tien Shan mountains.

The Soviet's 'Vega-1' and 'Vega-2' meet with the comet in Spring of 1986.

Deputy Director of the Astrophysical Institute of the Academy of Sciences of the Republic, Alexandr Kurchakov said: 'Within the framework of the international programme, Kazakh Astronomers have been assigned the task of coordinating the study of processes which are taking place around the nucleus of Halley's Comet. The head of the comet is one of the most interesting and difficult objects for observation. It is in this sphere that most turbulent and dynamic changes take place when the comet approaches the Sun.

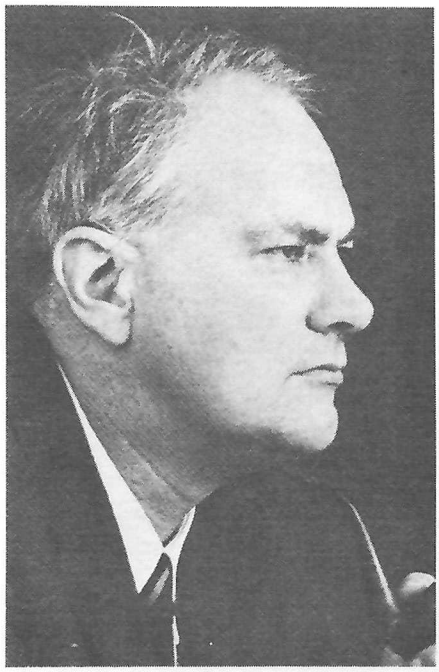
'At the moment the comet is far from the Sun and is not affected very much. It as all the more important to obtain early photos in order to record and analyse in the future the whole process of changes around its nucleus', Mr Kurchakov underlined.

Photos are also of practical importance: They will help to correct the trajectory of the probes which are moving towards a space rendesvouz.

Mr Kurchakov added that Kazakh scientists were getting ready to carry out extensive research into the temperature and compactness of the comet substance, as well as its chemical composition.

Soviet Shuttle

The Soviet Union have flown another test of their small model Space, Shuttle. Cosmos 1614 was launched on December 19 and was the Russians' fourth Shuttle development flight. The spacecraft made a controlled descent and was recovered from the Black Sea soon afterwards.



FROM AN ASTRONOMER'S DESK

RECENTLY CONSULTANT EDITOR PATRICK MOORE PACKED HIS TELESCOPE AND TRAVELLED TO SOUTH AFRICA. HERE HE REPORTS ON HIS VISIT AND GIVES THE LAST WORD ON 'CANOPSUS STREET'.

Recently I spent a couple of weeks in South Africa. I went there to make some television films about comets – and, of course, interest in these ghostlike objects is now very high indeed; Halley's Comet is on its way, and will be best seen from southern latitudes. But I also took the opportunity to renew old acquaintances, and visit some of the South African observatories.

Amateurs there are very much to the fore, as indeed they are all over the world. Jack Bennett, of Pretoria, is one of the most famous of all comet-hunters, and also one of the few observers to have made a visual discovery of a supernova in an outer galaxy; he works with a rich-field telescope, originally designed for the Moonwatch programme. (Do you remember Moonwatch? It was the network set up to track artificial satellites in the early days of space research, when we knew comparatively little about conditions in the upper atmosphere and 'near space'; it produced splendid results, and it was with reluctance that it was eventually given up – it had been overtaken by modern techniques.)

In Johannesburg there is José Campos, who hails from Mozambique. He recently made his first comet discovery, that of a periodical comet, and no doubt he will make more. He has a site which is far from ideal, with a poor horizon and inconvenient artificial lights around, so that his success is a great tribute to his skill and enthusiasm.

Fine Star atlas

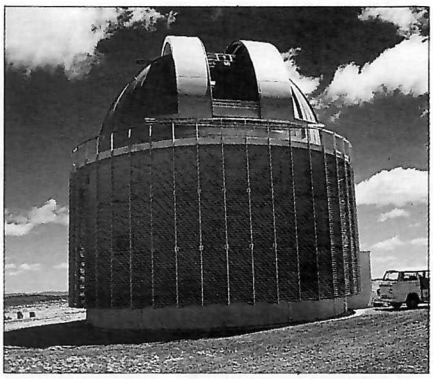
I also went to see my old friend Christos Papadopoulos, who lives on a pleasant hill just outside Johannesburg. As his name indicates, he is Greek, but has lived in South Africa for many years. He was a noted engineer (he has retired now) and has made his mark as an amateur astronomer whose work is thoroughly professional. He has equipped a first-class observatory, with a $12\frac{1}{2}$-inch reflector as its main instrument; I well remember my first sight of Eta Carinæ through it, years ago – this extraordinary star, once brighter than any other in the sky apart from Sirius, looks like an 'orange blob', and is associated with superb nebulosity.

For more than a decade Chris Papadopoulos worked away at a photographic star atlas. Finally he completed it, and it is a work of the highest class. It is used not only by amateurs, but by professionals everywhere; there cannot be many official observatories which do not have it.

Until our own century, the story of southern-hemisphere astronomy was more or less the story of South African astronomy. True, Edmond Halley went to St Helena in 1677 to make the first real southern observations, but the main work began in the 1820s, with the setting-up of the Cape Observatory; then, in the 1830s, Sir John Herschel took a telescope there, and well and truly laid the foundations of the astronomy of southern stars. His temporary observatory was at Feldhausen, outside Cape Town. I have been there; the site is now occupied by a school, but at least there is a monumental column on the site where Herschel had his telescope.

The main observatories of more modern times were at Johannesburg (the Union Observatory, later the Republic Observatory); Bloemfontein (Boyden Observatory), Pretoria (the Radcliffe Observatory) and the Cape. The main telescope at Johannesburg was a large refractor, which I know well, because I used it to make official observations of Mars during the Mariner 9 encounter period; for this it was ideal, and it was also used for double star observations. Unfortunately, the growth of Johannesburg meant that conditions for observation deteriorated, and most of the instruments, apart from the main refractor, were moved away. Today there is not a great deal of professional activity there.

Patrick Moore on Canop(s)us Street.



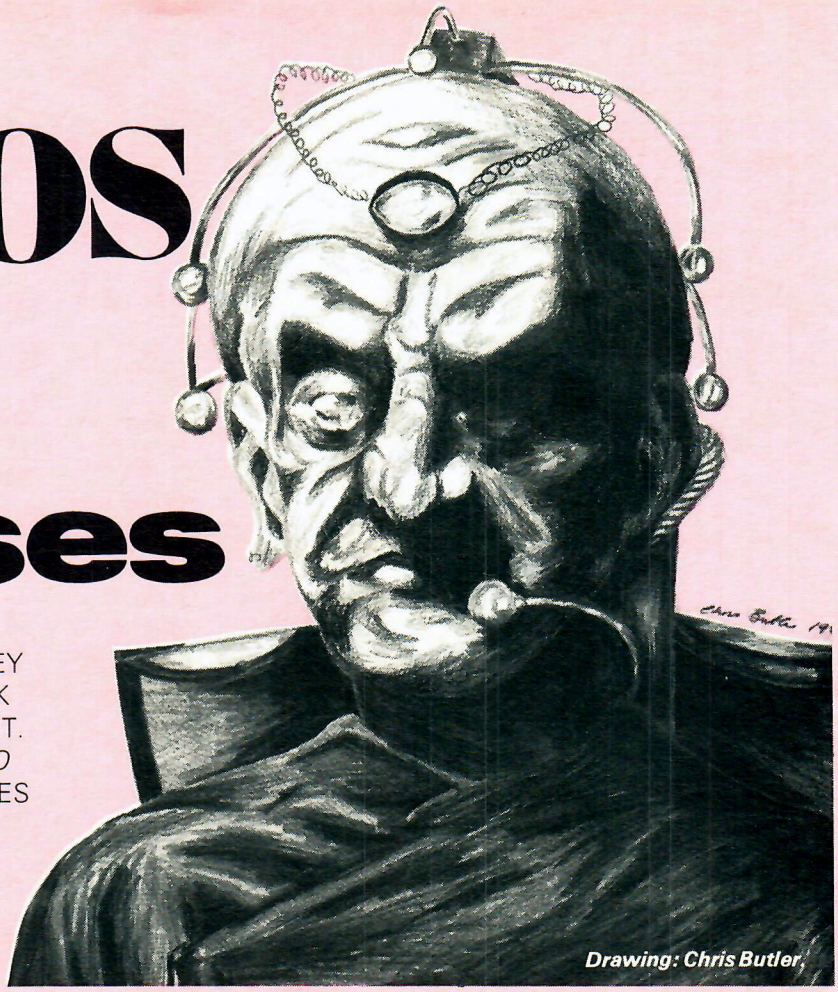
The 40 in dome at Sutherland, Cape Province.

What's in a name . . . ?

Some years ago the decision was made to shift all South Africa's main telescopes to the best available site, at Sutherland in Cape Province, which is well away from any major town. (It is also said to be the coldest place in the whole country, though by our standards it is warm enough.) The Cape 40-inch reflector was transferred there, and so was the 74-inch from Radcliffe, though Boydon has been left untouched. It was in some ways a sad decision, because it meant the end of the Radcliffe Observatory at Pretoria, which had been set up after the end of the war and which had had a bright history. The Observatory was literally dismantled, and today almost nothing is left; even the shell of the dome of the 74-inch has gone now, and it is a scene of desolation.

We must not be sentimental. Pretoria has spread; the sky had become inconveniently luminous; and the 74-inch is much more useful at Sutherland. But there is one amusing story which is, I think, worth relating. When the Radcliffe was set up, the Pretoria authorities named all local roads after stars: Rigel Road, Vega Road, and so on. One of these roads was named *Canopsus* Street. This came to the notice of Jack Bennett, who wrote to the City Council pointing out that there had been a slight mistake: Canopsus should read 'Canopus'. I have seen the Council's reply, which deserves to go down in history. 'We note the error,' it reads. 'However, all our maps have been printed and distributed, and cannot be altered now. Cannot you change the name of the star?'

DAVROS and other disguises



Drawing: Chris Butler.

MANY PEOPLE WOULDN'T RECOGNISE MICHAEL WISHER IN THE STREET – IF THEY SAW A WITHERED MAN IN HALF A DALEK HOWEVER, THINGS WOULD BE DIFFERENT. YET MICHAEL IS IN DEMAND FROM *WHO* FANS EVERYWHERE, AND HERE DISCUSSES HIS CAREER WITH WENDY GRAHAM.

Fate cannot argue with a Time Lord's prophecy, so when Tom Baker turned to Michael Wisher some years ago, as they sat over a meal after a long studio day and told him that if he became renown it would be for doing some small role about which Michael would think very little, they both laughed.

Now, many episodes and two regenerations of *Dr Who* later Michael is bemused to find that prophecy fulfilled, for suddenly he is in demand at *Dr Who* conventions to talk about his Tardis time as Davros, creator of the Dalek race.

The part of Davros was the culmination of a long run in many characters for *Dr Who* – he was part of a regular 'rep' company of actors, appearing from 1970 to '75 in about ten roles.

Most *Dr Who* fans still get a shock to find that there was a fairly normal looking actor under all the mask and 'slap' of Davros, and indeed, throughout his career for Michael to appear on stage or before the camera showing only his own face has been something of a rarity.

Michael was certainly unrecognisable in his first *Doctor Who* role, which came about by a quirk of chance – he supplied a voice for a Patrick Troughton story.

'I don't remember a lot about that first one' he said. 'I remember mainly Patrick's pixie boots! Those were the days when I used to do quick jobs to help pay the rent, because I live quite close to the TV Centre, and they used to phone me when they were stuck – it's the story of my life – whenever they can't get the person they want because his train's delayed or whatever, then they ring me. Anyway, this first *Dr Who* wasn't a Dalek or anything, it was someone on the phone or something like that.

Magic of Black and White

'I thought Patrick Troughton was an enchanting Dr Who – very charming, with a touch of danger. It was lovely to see him again in *The Two Doctors*. Patrick's Doctor was a bit like William Hartnell, I adored William Hartnell. I used to love watching him. What a shame they were all done in black and white – I suppose they could still show them in black and white, though perhaps sometimes black and white has an advantage. Sometimes it can look better.

'Some of the Hartnell ones were very effective in black and white and might well not have been so effective had they been done in colour, which can make everything look a bit blander, not so sharp.'

Michael's first appearance in front of the camera came after Jon Pertwee took over in the story, *The Ambassadors of Death,* in the Spring of 1970. 'That was another quick job. I was a reporter. They said 'Don't worry, you'll be on an idiot board,' but being a stage actor I never believe these stories so I learned it. I looked at this script and there was page after page after page of technical chat. So I arrived in the studio to do this thinking 'ah – autocue' No! The autocue had broken down and the other one was being used by the news department and they couldn't do without it.

'It was the most hair-raising experience, staring into this fishbowl of a camera lens, with a beard, which is bad enough, and just speaking these lines . . . page after page after page. Fortunately they cut it down. I still have nightmares about remembering all those words!

'John Abineri was in that. He was nervous just watching me. He started off with this moustache which covered his top lip and gradually by the end of the show the moustache got shorter and shorter, the hair came down over the right eye and the hand started twitching upward. (He demonstrates a Nazi salute.) Did anyone notice that? I thought it was quite subtle.

The next series, again with Jon Pertwee, brought one of Michael's favourite roles, as Rex Farrel, the wimp in *Terror of the Autons.*

Wearing a mask

'What do I remember about that? Basically Roger Delgado fixing me with his steely gaze and saying 'you are now under the will of the Master' and Rex going *'Uuuuuuuugr'* (a sort of wimpish ululation). I also remember getting dressed up in a mask of the Master's face and being chased across a field.

'They make these masks out of a special rubber material – which stinks – and they have very little breathing space inside.

'When you wear one for a while the skin underneath goes white, almost as if you're dead, and they kept me hanging about for the whole day, in the mask (and wearing a mask is a weird feeling, quite unnerving). Anyway, finally we got to the scene, I rushed across the field, and was duly shot at by my pursuers, and fell down dead.

'Now you've got to keep absolutely still, you can't twitch, as the camera comes nearer you stop breathing – no heaving chest – and the Doctor had to lean down and take the mask off, and I had to stay dead still, not a flicker – eyes open but up – no breathing, and the camera took ages to do its business and I was beginning to wonder what my face looked like, and I could just see Jon's expression, and this cloud of doubt crept into his eyes – they were all looking, in silence. Finally this voice said waveringly 'cu-ut' and Roger looked at me and said . . . 'is he. . ?' Apparently my skin had gone deathly white and they all thought I *was* dead!

A couple of years later Michael was back as Kalik in *The Carnival of Monsters*. Half the cast in that never met the other half. Half the story was set on a ship in the middle of the Red Sea, in the 1920's and all the people on this ship were living their lives in a kind of loop, doing the same actions over and over. They didn't

know it, but this bit of Earth had been put into a capsule by a travelling intergalactic showman, from thousands of years in the future.

'I was one of the future people, on this planet, Inter Minor, so we never met the rest of the cast, apart from Jon Pertwee when, as the Doctor, he broke through the time barrier.

'It was peculiar. There were people wandering round saying 'Is it my turn yet?'

'But there was wonderful writing in that story (by Robert Holmes) for the three effete characters.

'These effetes lived at the top of their society, their heads had become bigger, they had grey-blue skin and hair. They looked very bright but rather sinister. There was the Chancellor – the old woman – who was always flapping and panicking, then there was a sort of plastic mac character, the sort you see hanging around questionable shops in Soho, and then there was myself, a real 'whips in the cupboard' type. There was one wonderful line where one of the others said 'One

Michael in his most famous, and faceless, role of Davros, creator of the Daleks.

thinks he may be suffering' and Kalik leaned over and hissed 'Oh yesssssss' with relish. I thought that was very advanced for Dr Who! Possibly that was my favourite character – it all worked, except when the mask started to peel off and they had to cut out one of the scenes because the peeling had been picked up by the camera.

'It all comes down to the writing – whether it is William Shakespeare or Dr Who. With good writing it works, it does work, and I think Dr Who is worthy of good writing. I mean, I'm an enthusiast. I think it's great fun, it's timeless, and it deserved good writing.

In the firing line

'In *Carnival*, by the way, I had this rather peculiar costume, and suddenly I had this plethora of letters, very strange letters saying 'Dear Sir, how nice to see the thighs of young men again, especially when they're in those shiny high-topped boots – more of this please.' Being in front of the camera puts you in the firing line – and that's the sort of thing you can get. . .

After Kalik came a whole spate of Dalek voices, in *Fronter in Space, Planet of the Daleks,* and *Death to the Daleks* (all three by Terry Nation, the last with Tom Baker as The Doctor).

'Once again I was in because they couldn't get the people they wanted. The BBC seem to have this idea that people who work for them don't work for anyone else, so we're all sitting round waiting for them to get in touch. But one day all their Dalek voices were actually working, doing something else so I was rung up and asked 'can you do a Dalek voice?' I needed the money so I said 'Of course, of course' – full of confidence. So they said 'Well do one for me now' 'Err. . . Exterminate!'. 'You've got the job!' I think I've got a voice which sounds a bit Dalek-ish anyway – tinny!

'I learned that there are basically only three Dalek voices. Low, medium and high. The base one is the butch leader 'They will all be exterminated', the middle one is the organiser, who scurries about 'I obey' and the high one is the one who is going to crack up sooner or later, who panics 'Malfunction, Malfunction. I have failed. Self-destruct. Self-destruct' and the poor little thing blows itself up. . .

Late arrivals

'The fun bit of doing the Daleks was coming in late, because you're never called to the early rehearsals, when you're doing voices, so you go in and everyone says 'who's he?'

'They throw you a camera script and put you away in a corner of the studio in a sort of hide, a screen thing with hessian, slightly mouldy and torn, and they give you a monitor set and a microphone, so, one eye has to be on the script to read it, because you haven't rehearsed it, the other eye is on the monitor because when the 'ears' on the Dalek flash you've got to speak. Then you also have earphones on. In one ear you can hear what's going on on the studio floor and in the other you hear what's being said up in the control box – the problem with that is that what's being said up in the control box is far more interesting than what's going on on the floor.

'You can hear all the rude comments – it's blackmail time afterwards.

'But you do feel a bit cut off from everything in the little corner.

'What it would really be like to be a helpless creature inside one of those pepperpots – awful. They're very vulnerable. I was terrified when I first saw them but now I know what to do with them – you get them in a corner, take the lid off and squirt something inside. What's left of it sort of squirms about a bit and that's it.

Once again not first

'I feel a bit sorry for the Daleks, the modern age of technology has passed them by. I really think that in this day and age they should be floating off the ground. That'll make me popular – another £100,000 on the BBC's bill!.'

Michael's sympathy with the perambulating pepperpots with the plumber's friend up front ('did you know they used that for kissing?') may, in some small part be due to his next role in *Dr Who*, as Davros, creator of the race.

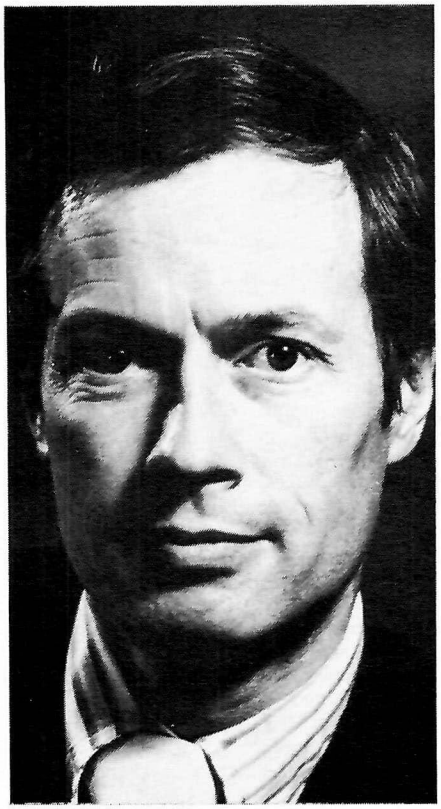
'Once again I wasn't the first choice. Then somebody had a bright idea – this is how I heard it – that wouldn't it be a good idea if at some point you could hear in Davros the beginnings of a Dalek voice?

'When the idea of showing the creator of the Daleks on Skaros was mooted the designer went away and came back with this feller setting in a half Dalek, and the idea was that because he was a clever scientists he had kept himself alive for the last 190 years by, as each part of him died, replacing it with a bit of machine.

'So the bottom bit was dead, the left side was dead, his eyes were dead, he had this blue

Michael, left, as seen in 'Cover Her Face' recently with John Vine and Roy Marsden. Photo: Anglia TV Ltd.

job in the middle of the forehead which did his seeing for him, his hearing was assisted by sensors round his head and what was left of his voice was strained through this little microphone.



Michael Wisher as himself. . .

Voice origins

'So you could hear through this the beginning of the Dalek voice, the idea of the whole thing. Davros was simply going to complete the process to make them invincible.

'He also had this sort of console in front, with knobs and switches and levers (to pull half a pint!).

'People don't realise how difficult it is to perform as Davros. I realised at an early rehearsal that it was as if one was going to be totally disoriented – try imagining going round with a paper bag over your head and you get some idea of the mask – you can't see properly, you can't hear properly, and you may think you know your lines perfectly, but when it comes to doing them with a bag over your head you dry up, partly because you can't see who you're talking to.

'Then, if you sit yourself in half a Dalek and pretend there's an electric motor there to move you around and there isn't, well, you have to paddle round with your feet.

'I sussed the problems early on, I thought 'I'm going to have trouble' so in rehearsal I sat in an antiquated bath chair with a paper bag over my head with two tiny slits for the eyes. When I decided to do this I arrived early to try it out and when the rest arrived they were somewhat amazed to see this paper bag wandering round the place with a strange voice coming out of it.

'It was also important to rehearse like that because the other actors couldn't see my face, so no expression for them to react to. Only the voice and the blue light to indicate annoyance or that he wanted to go to the loo or something (I used to leave little puddles all over the floor – I sneaked a bottle into the costume and tipped it out every so often).

'And paddling around inside half a Dalek is very painful – you sit in a half crouch – and wearing trousers makes it worse because they rub – so I did it wearing a kilt!

Eccentric at least

'So the final picture of me as Davros was – at lunchtimes – this bizarre, kilted and gymshod Davros wandering round – I couldn't eat anything through the mask, only drink beer – and I had to use a long cigarette holder in case I set fire to myself. I got some peculiar looks. . .

Michael only played Davros once. The second time Davros appeared another actor was sitting in the half-shell. 'Well, Davros was blown up at the end of the first story, then, with only three weeks to go before they started rehearsals they rang to ask me to go back, and I couldn't because I was going to New Zealand to work. I would have loved to do it again, but I couldn't.

'I was asked again in January '83 and I said 'yes, love to' and within three days of saying yes, there was a strike and it was postponed. They reckoned it would be done about June, so I kept that clear. They finally did it in August, but by then I was doing *Dame of Sark.*

'It was a shame, but my loss was Terry Molloy's gain – I thought he did a splendid job, but I must say I didn't go a bundle on the mask – a sort of petulant Ena Sharples look.

Michael's *Who* times concluded with Magric in *Revenge of the Cybermen* – in which he also supplied some voices, and finally he was Morelli, pilot of a spaceship in *Planet of Evil.* In this episode he also supplied the voice of Ranjit.

'I would love to do *Dr Who* again. I was lucky over the years to have played a large variety of roles, and I would love to do more – villains particularly. I think I've been dessicated, shot, blown up, eaten, turned into a green mess, mummified – I'd have to find some other way of dying!

. . .on stage as an English General in 'The Dame of Sark' (in which he also played a German officer). . .

Young people and plays

Recently Michael has been concentrating on stage work, appearing most recently in a short tour of *Roots* by Arnold Wesker in which he played Poppy Bryant, replete with moustache, battered cap and well-worn de-mob suit.

Before that he was in *Twelfth Night.* Both plays are on the syllabus for English Literature this year, and Michael feels strongly about how drama should be studied. 'I feel terribly sorry for pupils being bludgeoned into sub-

. . .fending off the unwanted attentions of two gentlemen in a stage production of 'Charlie's Aunt'. . .

mission by teachers. Can you imagine an Elizabethan audience having to pass an 'O' level in William Shakespeare before they went to the Globe theatre – they'd stay away in droves.

'But doing the plays was fun. We tried to demonstrate how they came about, the background, and held play mornings where we talked about the plays to the youngsters.

'So hopefully, gradually, people realise that Shakespeare is not about learning the verse and reciting it at 9 am, these were living plays.'

Drama is drama and writing is writing to Michael, whatever the time or the medium, so that there is little difference in some ways between William Shakespeare and *Dr Who.*

'The only way in which they're really different is that *Dr Who* is very rarely written in iambic pentameter, though when Tom Baker and I did a scene with Davros, during rehearsal we decided to take those big speeches and put them into iambic pentameter and they actually *worked,* except for the odd word. That particular scene was so well written it could have been in iambic pentameter.

'I think that speaks for itself because that scene was exceedingly well written, and I'm sure, Bill Shakespeare, had he been alive today would give his eye teeth to write for *Dr Who.* After all, the way Shakespeare writes – flits from scene to scene – television – *Dr Who* – no barriers. . . he'd have a marvellous time.'

Other work

Michael's long career started with 'swanning off' in plays and variety shows during his three and a half years with the RAF. After studying for two years with RADA he began his professional career with *Under Milk Wood* and a stint at the Phoenix Theatre. Among the many companies with whom he has appeared are the Belgrade, Coventry and the National. Other stage appearances include sundry tours of Shakespeare and Agatha Christie, music hall in Britain, Mallorca and the USA, and in the classics with Theatre Corporate in New Zealand, plus pantomime.

His TV experience goes back to the days when drama was transmitted live – he appeared in early episodes of two of the classics of cops and robbers material – *No Hiding Place* and *Z-Cars* 'I reckon you could lose half a stone in weight doing one of those' he commented.

More recently he popped up in Anglia TV's version of P D James's *Cover Her Face* with Roy Marsden, with whom he appeared in the series *Airplane* a few years ago. Another classic TV appearance was in the BBC's *Colditz.*

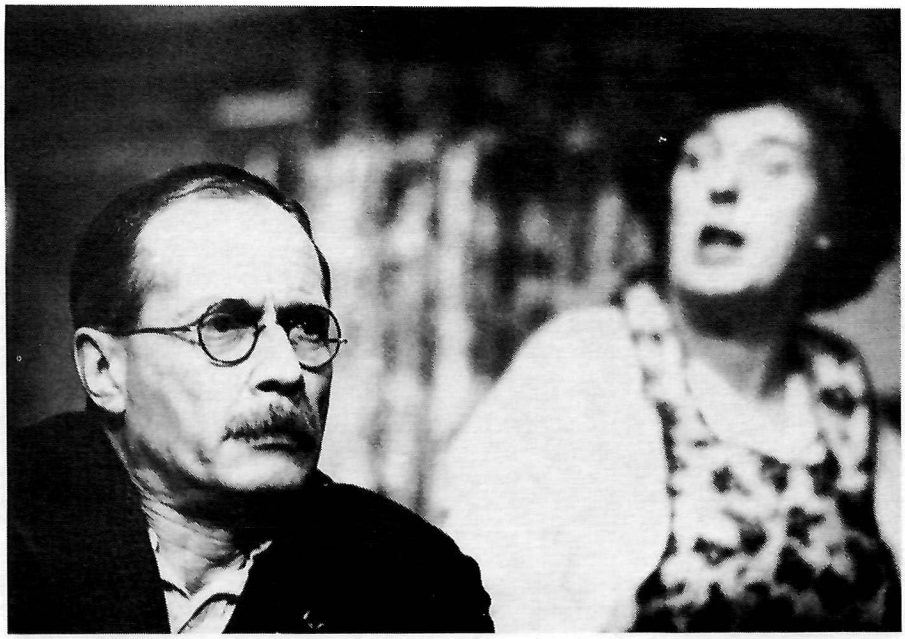
Upcoming are hopefully a new TV version of *Alice in Wonderland,* with a cast comprising many *Dr Who* stalwarts, and in the summer a reprise of *The Dame of Sark* on stage.

Unexpected events

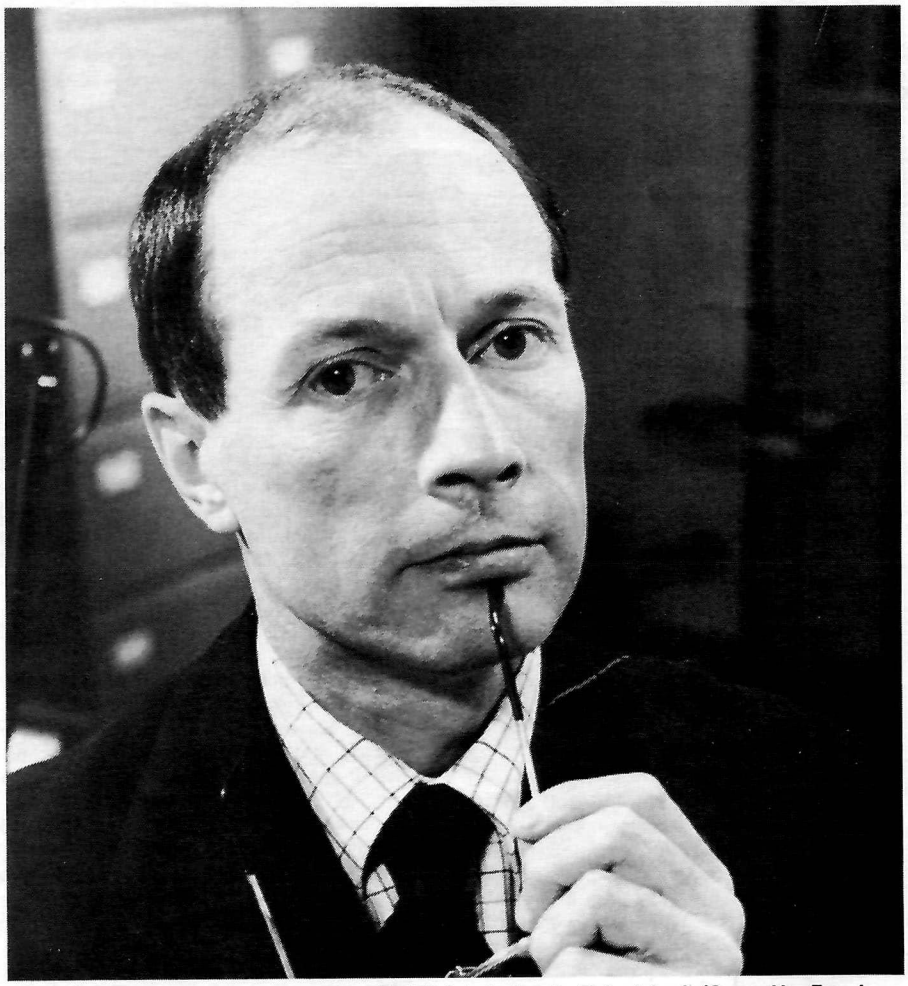
Michael's anecdotes about the stage and the disasters which can befall a performer are many and varied, ranging from the doors which stubbornly refuse to stay shut to once in pantomime:- 'I was playing the back end of an animal, the front end disappeared and I was left trying desperately to continue the dance. I tried going out through the exit, the door was stuck and I finally left through the fireplace.'

And then there was the time when he had to take a bath on stage – costume arrangements concluded with a poncho to be shed once in tub. However one night they forgot to add the cold water, Michael didn't realise this for some seconds (until after shedding the poncho) and he shot out of the boiling water to a bemused silence from the audience. This was back in the days when such matters were, to say the least, more carefully controlled. . .

In all, then, Michael is a multi-talented actor, and if you want to see him perform, check your programme carefully – chances are you won't recognise him under the make-up unless you do.



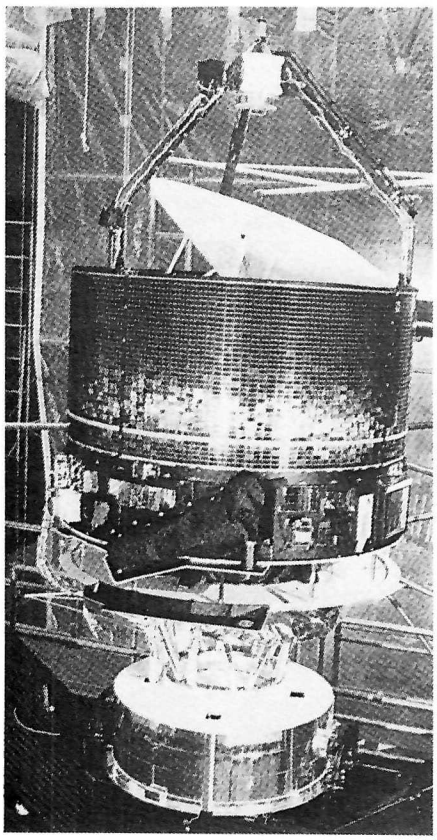
. . .as old Mr Bryant, in Century Theatre's production of 'Roots'. . .



. . .and again as expert code breaker, Mr Welch, in Anglia Television's 'Cover Her Face'.

THE COMET RETURNS

FROM THE END OF THIS YEAR TO THE MIDDLE OF THE NEXT, PEOPLE WILL BE SEARCHING THE SKY FOR A GLIMPSE OF HALLEY'S COMET. PATRICK MOORE PROVIDES BACKGROUND INFORMATION AND TIPS FOR COMET-GAZERS.



The ESA Giotto probe.

'This comet was so horrible, so frightful, and it produced such great terror that some died of fear and others fell sick. It appeared to be of extreme length, and was the colour of blood. At the summit of it was seen the figure of a bent arm, holding in its hand a great sword as if about to strike. At the end of the point there were three stars. On both sides of the ray of this comet were seen a great number of axes, knives and blood coloured swords, among which were a large number of hideous human faces, with beards and bristling hair.'

Those comments were made in 1528 by a French medical doctor named Ambroise Paré. Whether he was actually seeing a comet is by no means certain (no brilliant comet was reported in that year, and Dr Paré may have been deceived by a display of aurora). But his views do indicate the fear in which comets were held – and the dread of comets is not entirely dead even now. Moreover, of all comets it is Halley's which causes the greatest general interest, and at the present moment Halley's Comet is on its way back to the Sun for the first time since 1910.

Over the past few months I have had many dozens of letters asking me about the comet, so this seems a good time to say something about it. And first, let it be stressed that any object seen moving perceptibly against the starry background cannot be a comet. All comets are well beyond the top of the Earth's air, at distances of millions of miles, and so they shift very slowly indeed. If you see something travelling along noticeably, it will probably be an artifical satellite – or, of course, a meteor, which will last for only a second or two (unless it is something much more mundane, such as an aircraft or a high-flying weather balloon catching the sunlight). Meteors are cometary débris; the average meteor is no larger than a sand-grain, and becomes visible only when it dashes into the upper air, becoming hot by friction and burning away to produce the luminous appearance of a shooting-star.

Comets are of two main types. Some are periodical – that is to say, they travel around the Sun in periods of a few years or a few tens of years, so that we always know when and where to expect them. Others have orbits so eccentric that their periods amount to hundreds, thousands or perhaps even millions of years, so that we never can predict them, and they are always apt to take us by surprise; we generally term them 'non-periodical', though this is not strictly true inasmuch as all comets will eventually return unless they are perturbed by one of the planets and thrown into an open orbit – as sometimes happens.

Halley's is unique

Apart from Halley's, all the really bright comets are non-periodical. During the last century there were several really brilliant visitors; for example the comets of 1811, 1843, 1858, 1861 and 1882, all of which were visible with the naked eye in broad daylight. More recently they have been scarce, and the last really 'great' comet was that of 1910, known as the Daylight Comet, which appeared in January, a few weeks before Halley. (Most people who claim to have seen Halley's Comet in 1910 really saw the Daylight Comet instead.) There was one very bright comet in 1965, but it appeared only briefly, and was never well seen from England.

So Halley's Comet is unique, and the present return is the most important in its history, because for the first time we can send space-craft to it. No less than five are due to rendezvous with the comet in March 1986: two are Russian, two Japanese and one European. The Americans cancelled their Halley probe on the grounds of expense, and I think that they are liable to regret the decision for the next seventy-six years!

Halley's Comet has a long history. It was certainly recorded in B.C. 1059, and every return since that of B.C.87 has been observed. It was visible in 1066, when Duke William was making ready to invade England, and is shown on the famous Bayeux Tapestry; it came back in 1301, and was seen by the Florentine artist Giotto di Bondone, who used it as his model for the Star of Bethlehem in his painting "The Adoration of the Magi". In 1456 the current Pope, Calixtus III, preached against it as an agent of the Devil. In 1682 it was seen by Edmond Halley, who realised that its orbit was the same as those of the comets of 1607 and 1531; he predicted that it would come back in 1758, and on Christmas Night of that year it was duly recovered. Since then it has been back once more in 1835, when it was observed by Sir John Herschel from South Africa and by other astronomers all over the world, and in 1910, when the first photographs of it were taken. After that it vanished until it was picked up again from Palomar, with the 200-inch Hale reflector, in October 1982. The next perihelion is due on 9 February 1986.

The theory so far

According to modern theory, a large comet has most of its mass in its nucleus, which is made up of ices together with solid particles. As the comet nears the Sun, the ices begin to evaporate, and the nucleus is surrounded by an opaque head or coma; material is driven off to form a tail or tails, so that a certain amount of mass is lost. Tails are of two kinds: gas, and dust. Generally the gas-tail is straight and the

dust-tail curved, but both point more or less away from the Sun, because the tail material is driven outward by the solar wind – made up of streams of charged particles sent out constantly by the Sun in all directions. Therefore, when a comet is moving away from the Sun, it travels tail-first.

Not all comets have tails (many of the faint short-period comets do not), and we know very little about the nuclei, because we cannot see them through the enveloping coma. But it is clear that the mass of a comet is very low, so that the nucleus can hardly be more than a few miles in diameter – a few tens of miles at most. The coma of the comet of 1843 was larger than the Sun, but the total mass was much less than that of an average-sized asteroid.

At some returns Halley's Comet has been magnificent. Probably the brightest apparition of all was that of 837, when the integrated magnitude of the head was almost as bright as Venus and the tail stretched 93 degrees across the sky. Sadly, the present return is much less favourable, because at perihelion the comet will be on the far side of the Sun and will be invisible from Earth – though there will be attempts to study it from the Pioneer probe which is now orbiting Venus. To make matters worse from our point of view, the comet will be at its best, after perihelion, when it is well south of the celestial equator, and will not rise from anywhere in Britain.

Where and when

However, we must not be too gloomy. With luck, the comet will be an easy naked-eye object towards the end of this year, when it will still be accessible to us. The path through the stars is shown in the diagram. Conjunction with the Sun occurs in mid-June, when the comet will be about 330,000,000 miles from the Sun, so that it is not likely that regular observations by amateurs will begin much before August. During August the magnitude should rise to about 13, and late in the month the comet will pass near the star and Chi^1 and Chi^2 Orionis, so that it should be detectable in the morning sky before sunrise. By the end of September the magnitude should be around 12, and the main interest will begin.

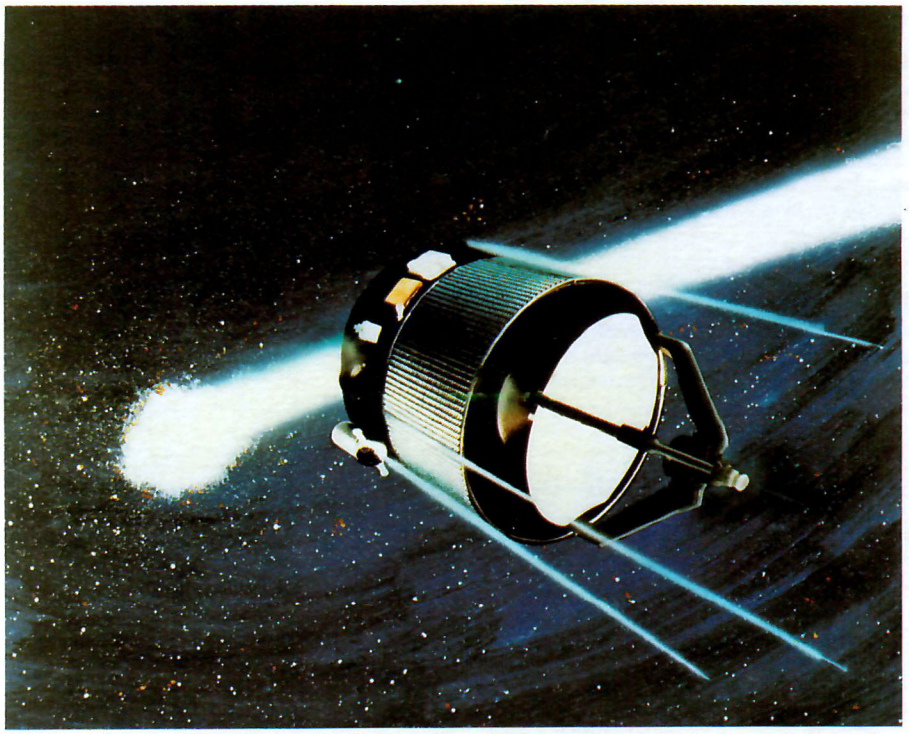
During October 1985 the comet will move retrograde across Taurus, reaching magnitude 10; it will then be about 150,000,000 miles from Earth. In November the movement will take the comet across Taurus into Aries; on the night of November 16 the position will be just south of the Pleiades, which will make location easy. On November 17 there will be the first approach to Earth, at just under 60,000,000 miles, and the comet will be closely south of Gamma Arietis, the well-known telescopic double star.

As the comet moves through Pisces into Aquarius, during December, the magnitude is expected to reach 5, so that binoculars will give good views and the comet should be visible with the naked eye. At the end of the year the position will be close to the star Gamma Aquarii. Will there be a long tail? As yet we do not know, though it is true that at past returns the tail has developed properly only after perihelion; we must hope for the best. At any rate, Halley will be well and truly on view, and no doubt it will be the best-observed comet in all history.

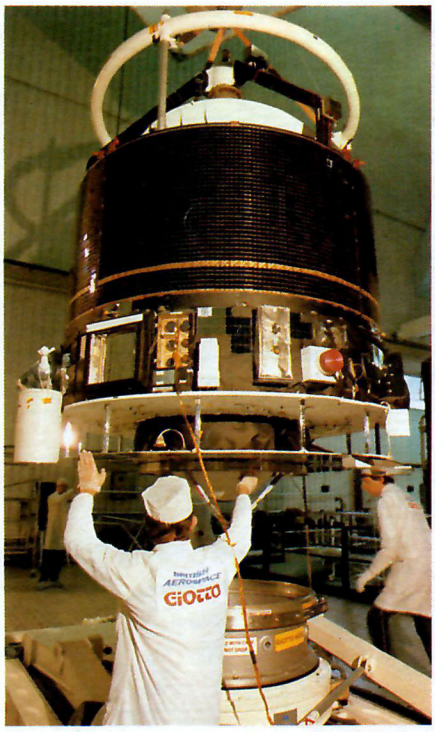
In January the comet will continue to move south; on the 13th it will be close to Jupiter and the crescent Moon. However, the distance from Earth is increasing, and by the end of January the comet will be more or less lost in the evening twilight – so that, alas, British observers will have had their main chance of watching it. After perihelion, on February 9, the tail may reappear very low in the south-eastern sky before dawn, and the head may reach magnitude 3, but the southward motion will continue throughout March, and by the end of the month the declination will be –37 degrees, so that there will be no hope of seeing anything at all from Britain. Of course, this is the time when the space-probes will, pass by Halley, and in one case (the European vehicle Giotto) enter it.

April 1986 will be the best month for viewing – provided that you are prepared to go to Australia, New Zealand, South Africa or indeed anywhere well south of the equator. The comet will be at its most brilliant at the end of the first week; the position will then be in Centaurus, so that before dawn it will be almost at the zenith from southern countries, and we may expect an extensive tail, perhaps up to 30 degrees long (remembering that the distance between the Pointers to the Pole Star is 5 degrees). The total magnitude may be between 2 and 3, but will fade quite quickly as the comet recedes from the Sun and the Earth. On 24 April there will be a fortunate bonus: there will be a total eclipse of the Moon, so that the sky will darken and the comet will show up. Photographers will certainly make the most of their opportunity.

Before the end of April the comet will have passed into Hydra, and will again be available to British observers, but the magnitude is decreasing rapidly; this will continue through May, and naked-eye observers will certainly have lost their final chances by late in the month. Binoculars will allow the comet to be followed for longer, of course, and modest telescopes should continue to be useful throughout June and July. Conjunction with the Sun occurs again in August, when the distance from the Earth will be over 350,000,000 miles and the magnitude will have fallen to about 9. By the time that the comet reappears in the dawn sky, in November, it will be beyond the range of



Giotto on interception course with Halley's Comet. The probe is intended to pass through the coma and photograph the comet's nucleus, a mission it is unlikely to survive. **Photo: BAe.**



Giotto in the workshop. **Photo: British Aerospace.**

amateur instruments. Large telescopes should keep track of it until 1989 at least, after which it will vanish until it is picked up once more as it comes back in 2061.

Observing equipment

I have had many inquiries about the best equipment needed for observing the comet. With reluctance, I must give my opinion that very small telescopes – such as the Japanese 2- and $2\frac{1}{2}$-inch refractors, and reflectors with mirrors below 6 inches in diameter – are unsuitable. They have low light-grasps and inconveniently small fields of view. Rather than spend much money on a telescope of this kind, I strongly recommend investing in a pair of binoculars. If you can manage several pairs, so much the better. An ordinary pair – say 7 × 50 (magnification 7, each objective 50 millimetres across) will give good views. Obviously a higher magnification will show more detail, though with anything above ×12 or so the binoculars become too heavy to hand-hold, and some sort of a mounting is desirable. But I very much fear that people who buy very small telescopes will be disappointed, and it is a sad fact that at the moment there is no such thing as a good, cheap astronomical telescope – while good second-hand telescopes are now about as common as great auks.

The Russian Vega probes are on their way. (Note that the name has nothing to do with the star Vega; indeed, the Russians usually give the spelling Veha.) They are to go to the comet by way of Venus, and as they pass by they will drop probes into the atmosphere of that curious and decidedly unwelcoming planet. Each Venus vehicle will be a 'balloon', designed to float around in the planet's atmosphere and send back data from different levels. Their batteries are intended to last for about 60 hours after entry, though after around two days the balloons will cross from the night side of Venus into the day side, and the heat will probably make them pop!

The rendezvous with Halley, on March 8 1986, will be of great importance. All kinds of investigations will be carried out, and an attempt will be made to locate the position of the nucleus inside the coma. This will also be one of the tasks of the two diminutive Japanese probes, the more important of which is named Planet A. The information will be passed on to the European Space Agency, so that last-minute corrections can be made to the trajectory of Giotto. Giotto will penetrate the coma on March 13, and will, we hope, send back information from the heart of the comet, perhaps even sending pictures of the nucleus itself. The data will be received at Parkes, in Australia, with the 210-foot radio telescope there, and will be sent on to Darmstädt in Germany, where the pictures will be electronically assembled. (I hope to be there, with a *Sky at Night* television unit, so that we can show the pictures straight away.)

Frankly, there is little hope that Giotto will survive the encounter. The relative velocity will be very high, because Halley's Comet has retrograde motion round the Sun, and Giotto will meet it almost head-on. A collision with even a small particle will have serious consequences, and any encounter with a lump of ice or rock of appreciable size will mean the end of the mission. All we can hope is that Giotto will survive for long enough to send back useful data.

Clues to History

Why is all this so important? Well, comets are probably very ancient; it is thought that there is a whole 'cloud' of them moving round the Sun at a distance of about a light-year, and that all comets come from this cloud. In finding out more about them, we are therefore finding out more about the past history of the entire Solar System.

Let it be said again that Halley's is the only bright comet which we can predict. When an unexpected brilliant visitor appears, there is simply no time to make a probe ready and launch it into the correct orbit. Of course, plans are already being made to send spacecraft to other periodical comets – the Americans hope to contact Kopff's Comet in the 1990s, for example – but this is not so significant.

If a comet loses mass each time it returns to perihelion, it must eventually die inasmuch as it will lose all its volatiles. Several periodical comets seen regularly during the last century have now disappeared, notably those of Brorsen and Biela. But calculations indicated that Halley has made at least 2,000 returns, and will make an equal number in the future before its gas is exhausted.

Admittedly, it is a great pity that this return is so unfavourable from the point of view of sheer spectacle (and, moreover, that of 2061 will be even worse). But scientific returns are expected to be great, particularly if Giotto is a success. Before this time next year, we may know a great deal more about the nature and composition of comets than we do at the moment.

For most of us, this will be our one and only chance of seeing Halley's Comet. So make the most of your opportunity – and if you have the prospect of going to the Southern Hemisphere in April 1986, I strongly urge you not to miss it. There can be few celestial objects so intriguing as this, the most famous of all comets.

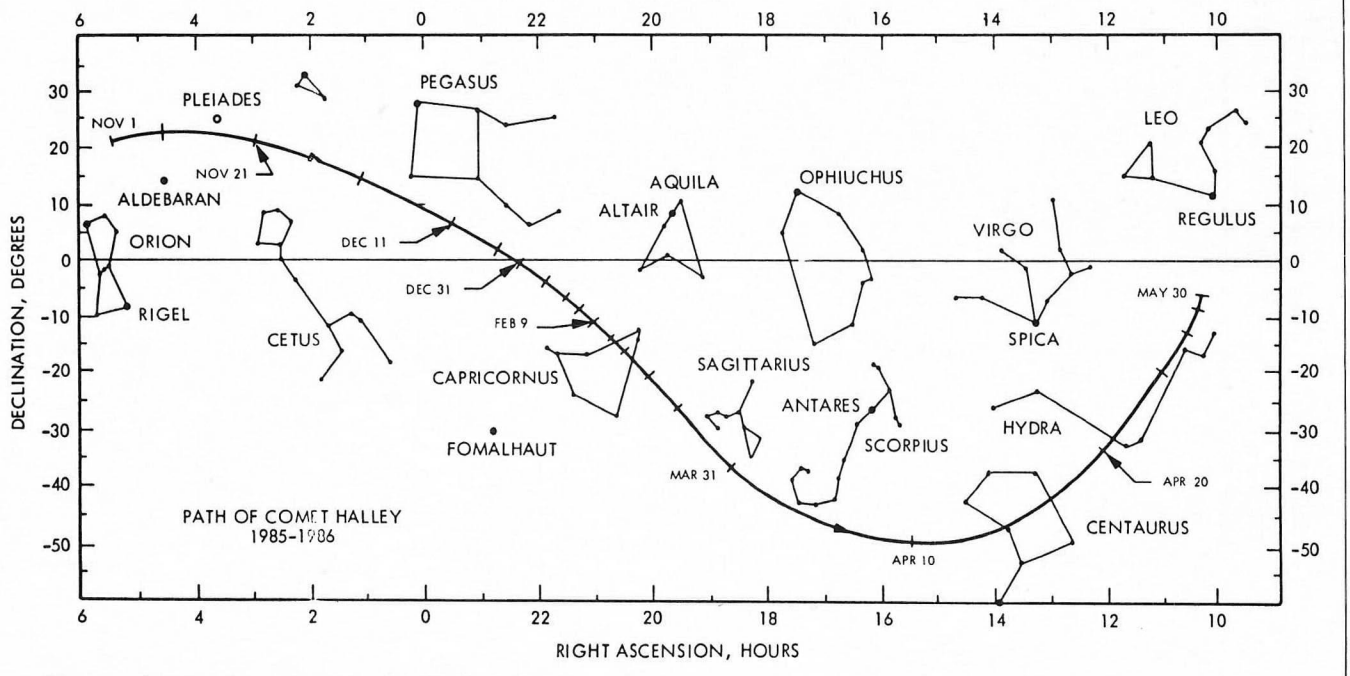
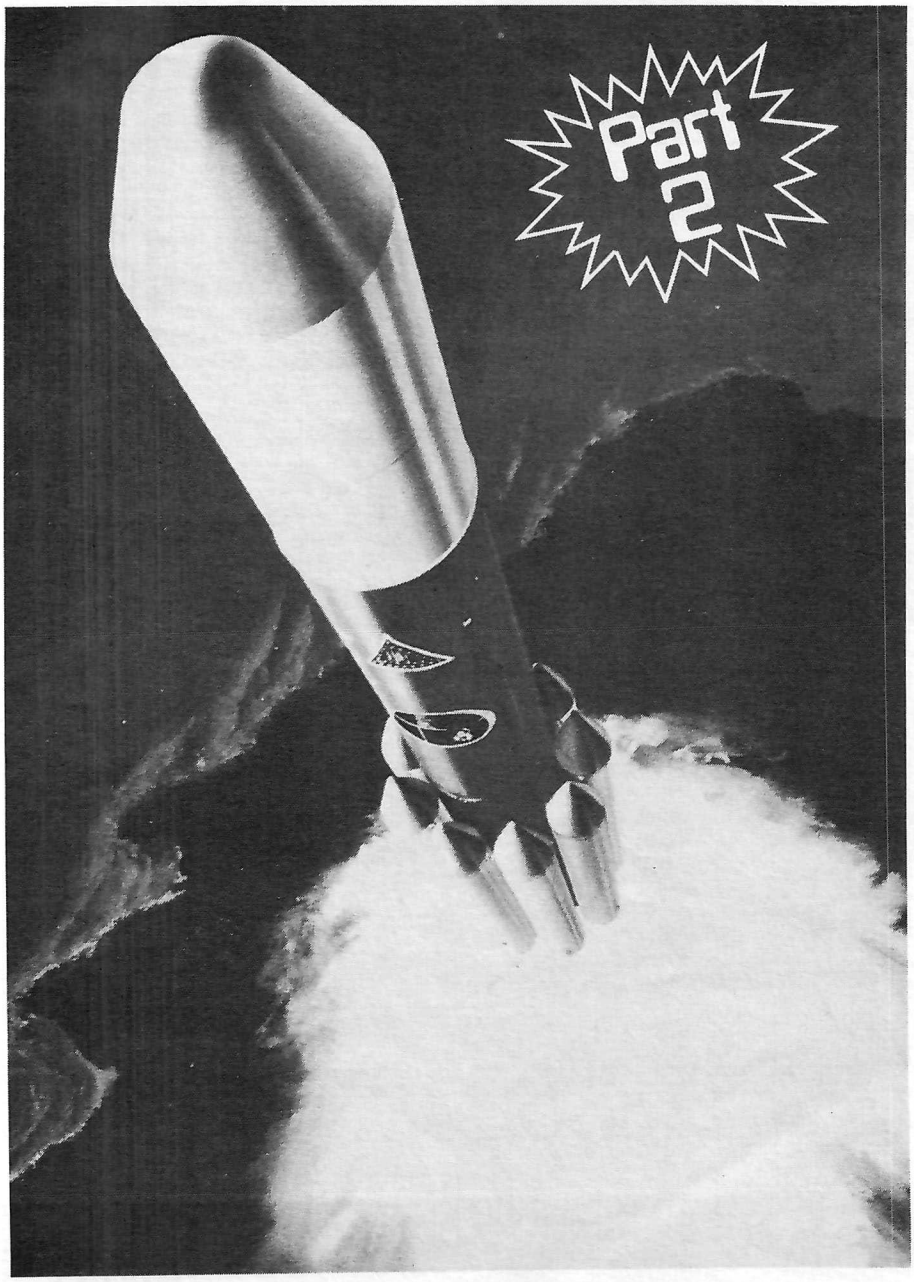


Diagram showing the projected path of Halley's Comet between Nov '85 and May/June '86. For precise details of viewing conditions during the visit, see the section titled 'Where and when'.

IRAS

300 DAYS OF DISCOVERY



IRAS BROUGHT RECOGNITION TO BRITISH SCIENTISTS (INCLUDING THE AUTHOR) AND MUCH NEW INFORMATION ABOUT THE GALAXY. DR JOHN DAVIES CONCLUDES HIS REPORT ON THE RACE AGAINST HEAT MISSION OF LAST YEAR.

As well as observing dust in our solar system IRAS was able to detect material orbiting other stars. Although the dust cannot be seen directly it is detectable because it is warm and so emits infrared radiation, any star which is unusually bright in the infrared is probably surrounded by warm dust. Just such an infrared excess was found for the nearby star Vega, a bright blueish star in the summer constellation of Lyra, The Lyre.

Vega is about twentysix light years from Earth and about twice the size of our Sun. The fact that Vega is both close to the Earth and comparatively bright has led to it being intensively studied from the ground. Since Vega is so well studied it is often used as a 'standard candle' to calibrate new astronomical instruments and IRAS observations made for calibration purposes showed that Vega was unusually bright in the long wavelength infrared. At first the astronomers responsible for calibration, Drs H. H. (George) Aumann and Fred Gillett believed that the IRAS detectors were malfunctioning but a series of tests on other similar stars showed that IRAS was operating correctly and that it was Vega that was not behaving as expected.

First news of the discovery came at one of the informal IRAS science meetings held amongst the astronomers about once a week. It was immediately decided to follow up the discovery with further observations to get more information. The results of the measurements show that Vega is orbited by a cloud of dust about twelve thousand million miles from the star, a distance roughly twice that of Pluto from our Sun. The temperature of the dust is estimated to be about 85 K (—188C), a little warmer than the temperature of liquid nitrogen gas, and the grains of dust seem to be larger than typical interstellar grains. The relatively large grain size means that the dust around Vega is accreting, small grains are sticking together to form larger ones, and this may mean that a new solar system is beginning to form around the star. Another possibility is that the infrared radiation comes not from small dust grains but from a shell of comet like objects orbiting Vega. If this idea is correct it could mean that the process of planetary formation is already well advanced in the Vega star system.

One point is however worth remembering, even if Vega has planets it is unlikely that life will ever develop on them. This is because Vega is much more massive than our Sun and so evolves more quickly. Long before any advanced form of life could develop in the Vega system, indeed probably before any planets could finish forming, the central star will start to run out of nuclear fuel and expand into a red giant. This expansion will almost certainly destroy any orbiting material in the

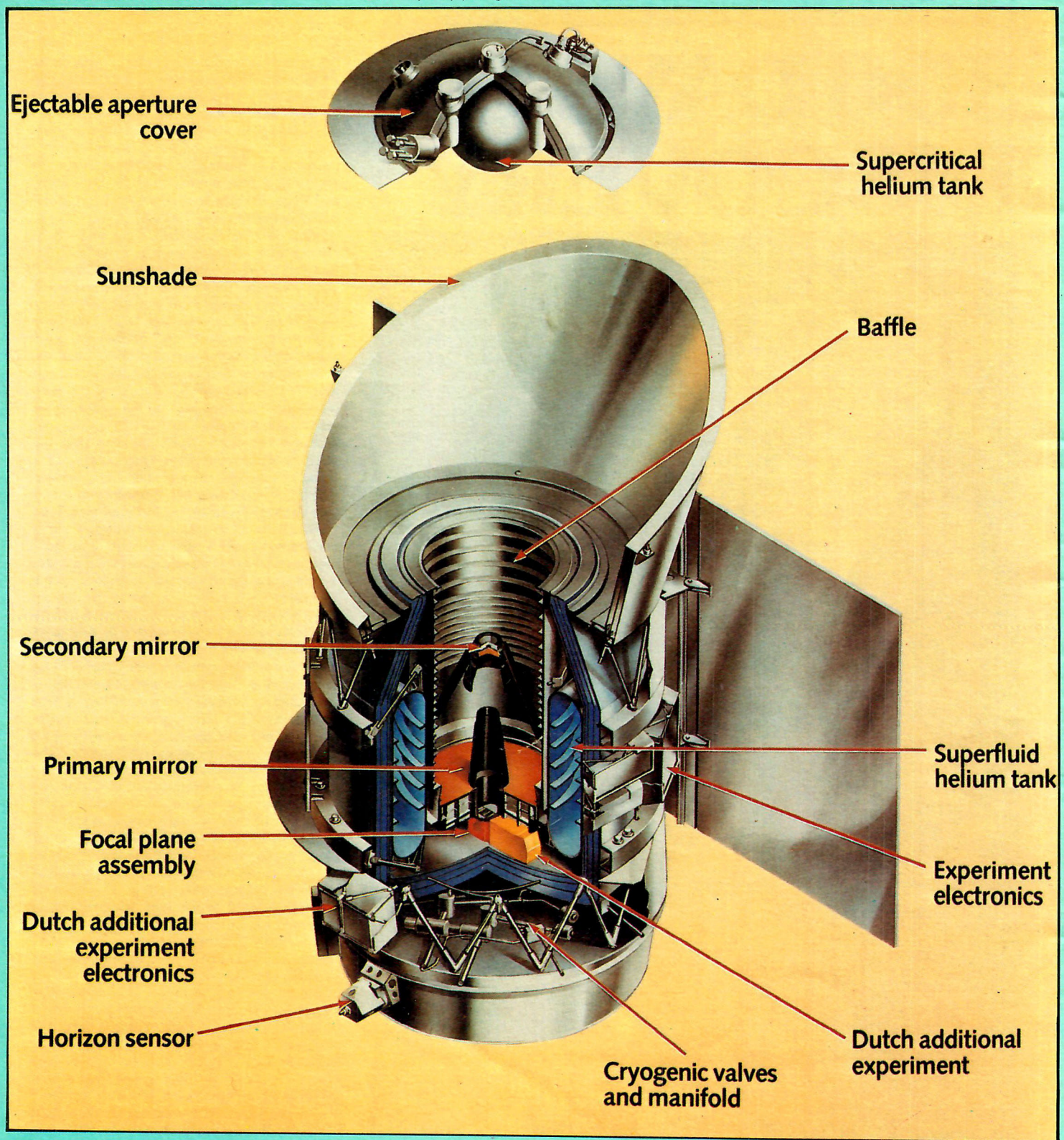
process and so all chance of life developing will be lost.

The importance of the Vega discovery was confirmed when observations of the star Formahaut, in the constellation of Piscis Australis (The Southern Fishes) also showed the presence of a dust shell. The existence of these shells tends to suggest that planetary systems around other stars in our galaxy may be much more common than previously believed, an exciting prospect for astronomers interested in extraterrestrial life.

New stars and old stars

Little is known about the ways in which stars like our Sun form. This is because they are born hidden from sight in the dark interstellar clouds. One of the major objectives of the IRAS mission was to try and discover very young stars using the ability of infrared radiation to penetrate the obscuring dust. This attempt was dramatically successful, IRAS detected bright infrared sources in several dust clouds and these hot spots are almost certainly very young stars hidden deep within the clouds.

One such cloud is known as Barnard 5, after the American astronomer E. E. Barnard who compiled a catalogue of dark nebulae. Barnard 5 is about one thousand light years from Earth and in it IRAS detected four unusually warm, compact areas. These are believed to be newly formed stars, each less than one million years old, still surrounded by shells of dust. In a short time, astronomically speaking, the radiation pressure and stellar winds from the new stars will blow away the surrounding dust



and they will emerge into view.

IRAS also scanned other known star forming regions including a dark cloud in the southern constellation of the Chameleon. Over seventy bright infrared sources were detected during these scans. Some of these sources are normal stars in the distant background whose visible light is totally obscured by the dust and gas in the cloud, but others are very similar to the sources seen in Barnard 5. IRAS observations of the objects in the Chameleon cloud, together with optical studies of young stars found in the same region will shed important new light on the processes of star formation.

Also of interest to astronomers studying the evolution of stars were IRAS observations of the star Betelgeuse, the bright star in the upper left of the constellation of Orion. Betelgeuse is a very old star which has used up most of its nuclear fuel and expanded into a red giant, its diameter being about five hundred times that of the Sun. Observations of Betelgeuse by Dutch astronomers showed that the star was surrounded by three large shells of dust, the largest being about nine light years across. The shells were probably ejected between about fifty thousand and one hundred thousand years ago as Betelgeuse underwent a series of dramatic eruptions.

Detailed studies of these shells also revealed another interesting phenomena in the space around Betelgeuse. The shells of dust are not symmetrical, like the rings of a target, instead the star seems to be off centre. Since it is most unlikely that the material was ejected in this unbalanced way it implies the existence of an interstellar wind, probably of hydrogen gas, blowing past the star and distorting the shells. Alternatively Betelguese itself may be moving through an interstellar gas cloud and leaving its shells behind it as it does so.

Infrared Cirrus

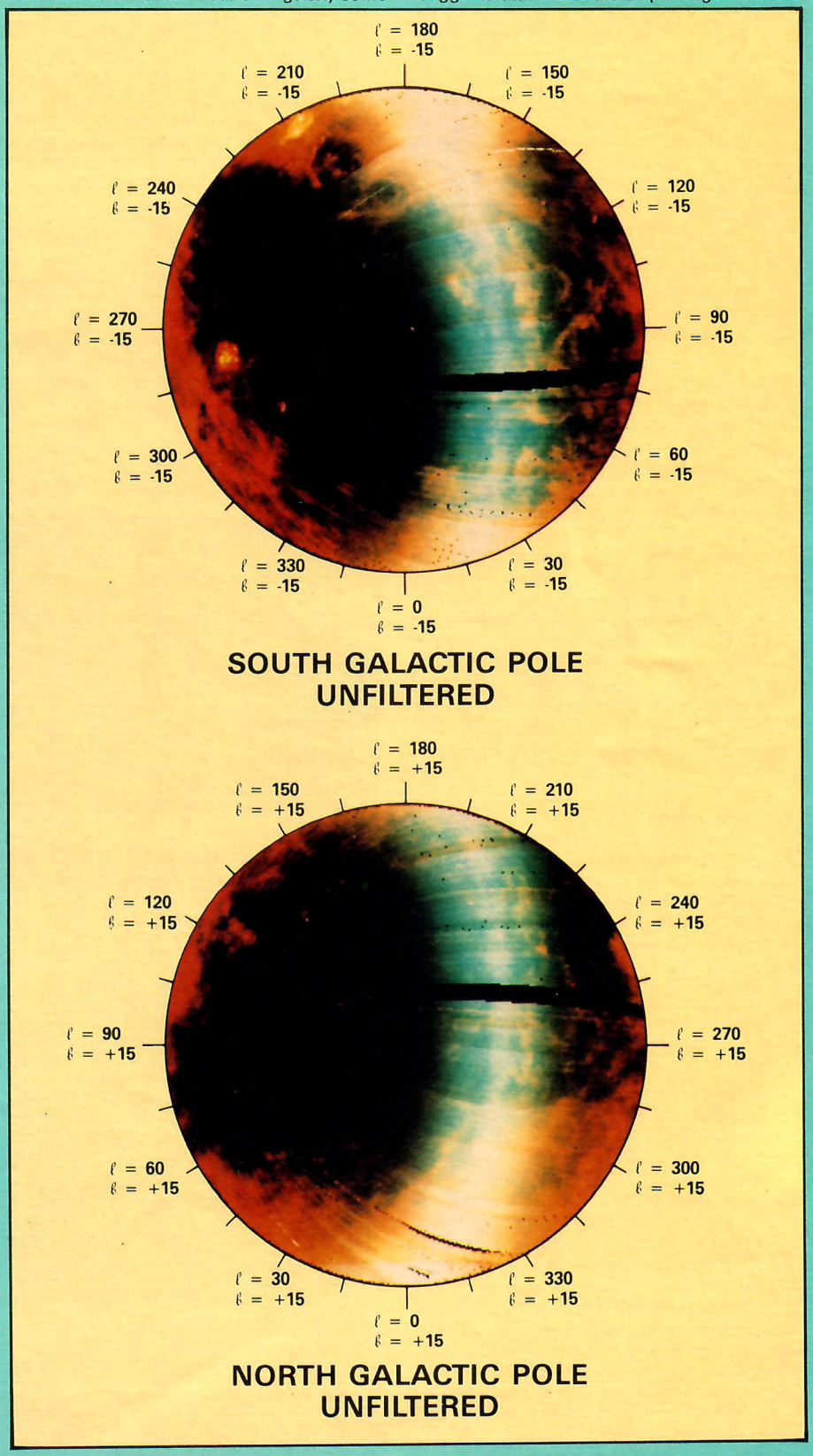
Finding dust shells associated with stars, both old and new, was interesting but not really unexpected. Far more surprising was the IRAS discovery that cool clouds of dust seem to be found all over the sky. The dust appears to be at temperatures of about 35 K (—238C) and its superficial resemblance to Earthly clouds has given rise to the name of 'infrared cirrus'. Unfortunately it is not possible to say with certainty how far from the solar system the infrared cirrus is found, IRAS measurements merely indicate that it is further than one thousand astronomical units, that is at least fifty times as far away as Pluto.

There are two possible explanations for this exciting discovery, IRAS may have detected a huge swarm of distant comets or the dust may be in the form of large interstellar clouds, well beyond the solar system. The possible existence of a huge cloud of comets loosely bound to the Sun was put forward about thirty years ago by the Dutch astronomer Jan Oort on theoretical grounds. Oort's cloud has never been observed directly and this has led some astronomers to challenge its existence, so if IRAS has really detected the infrared emission from the Oort Cloud it would be of great importance to the study of comets.

However at least some of the infrared cirrus seems to be connected with the huge clouds of interstellar hydrogen mapped out over the years by radio astronomers. This suggests that the dust is actually much further from the Earth than the Oort Cloud and is truly interstellar. Detailed analysis of the IRAS data, possibly combined with further infrared observations from high flying aircraft, may be able to tell astronomers more about this exciting new phenomenon.

Galaxies

Although IRAS observations were mostly of stars and dust clouds in our own galaxy some extragalactic objects were seen. In the spiral arms of the nearby Andromeda galaxy, star formation regions were clearly seen as was the emission from old, cool stars in the nucleus. Many other distant galaxies were detected and analysis of these showed that the spirals, like Andromeda, are rich in dust and star formation regions whereas the elliptical galaxies are devoid of new stars. This suggests that either the elliptical galaxies are



older than the spirals or that they have somehow evolved differently. Whichever explanation is true the IRAS results will have much to tell astronomers about the process of galaxy formation and evolution.

Even more interesting were observations of a number of unusual galaxies which were much brighter in the infrared than expected. When photographs of these galaxies were examined many of them were found to be distorted by collisions or near misses with other galaxies. This suggests that when two galaxies interact in this way it triggers a massive burst of star formation within each galaxy, dramatically boosting the infrared energy given out. These so called starburst galaxies are fifty to a hundred times brighter in the infrared than a normal galaxy of the same size. It has even been suggested that these unusual galaxies may contain a quasar-like object at their centres.

The total of galaxies detected by IRAS has not yet been worked out but estimates place the total at about fifteen thousand, enough to do important statistical studies of the distribution of galaxies throughout space.

Blank fields

Although many of the objects detected by IRAS can be identified with known stars or galaxies some cannot. About a hundred IRAS objects appear to have no counterpart which can be seen in ordinary light. Using the brightness in the infrared it is possible to make guesses at what these invisible objects are. They may be nearby brown dwarf stars, too cold to emit visible light, or small star forming regions hidden completely by obscuring dust. The most likely explanation is that they are distant starburst galaxies too faint to be seen in visible light. This idea has been confirmed in some cases by long exposure photographs which reveal a very faint galaxy at the precise position of the IRAS object. Some of the blank field sources however remain unidentified and unknown.

End of mission

When IRAS was launched it was expected that the vital helium coolant would last only six months, but a few weeks after launch the estimates were revised suggesting that the helium might last until the end of 1984. However, on November 22 the supply of helium ran out and almost immediately the telescope began to warm up. One by one the vital infrared detectors stopped working over the next few hours. Within a day IRAS was finished as an astronomical satellite, although all of its onboard systems except the telescope continued to work perfectly. The satellite was then handed over to the engineering team who wanted to carry out some final tests before the IRAS was shut down for good.

The reaction of the IRAS team at the ground station to the news was a mixture of shock, sadness and relief. The shock came from the suddenness of the end, several weeks ahead of expectation, the sadness from the realisation that this fantastic mission was over, there would be no more IRAS comets or starburst galaxies. Also rather sad was the realisation that very soon our foreign colleagues would be returning to Holland and America and that the 'IRAS team' would gradually disperse back to their various universities and other institutions.

There was however an undeniable sense of relief amongst the ground support teams who had been working flat out for over a year, many living away from home in local hotels or rented houses. At last there would be time to relax and look carefully at the scientific bonanza from the mission without fear of constant interruption as problems arose on the satellite or with the ground computers. After three hundred days of discovery it was time to go home.

In many ways, though, the end of the satellite was only a beginning because much remained to be done before the IRAS sky catalogues could be released to the astronomers around the world. This work went on steadily throughout 1984 at the Jet Propulsion Laboratory in Pasadena, California and the first versions of the catalogue were complete by the end of the year.

British work recognition

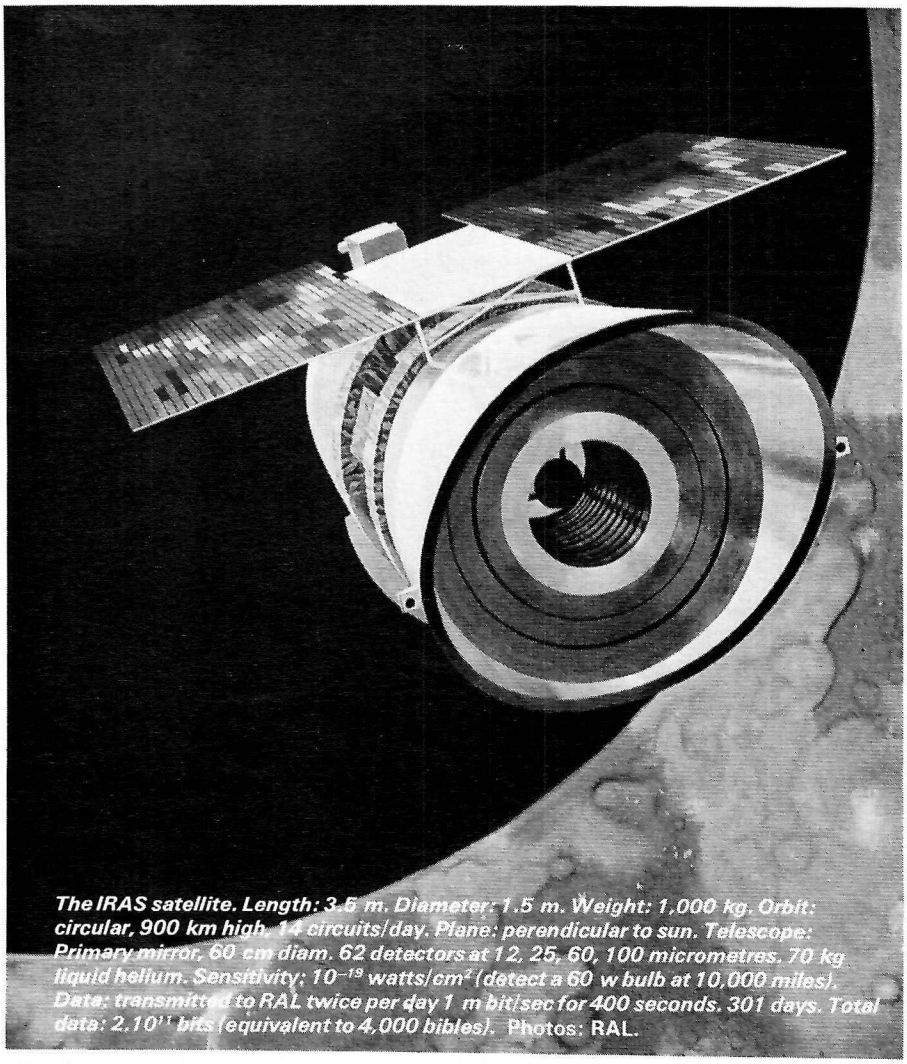
To mark the completion of the mission, and in recognition of its success, NASA made several awards to the IRAS project personnel. Various British team members won individual NASA Public Service Medals, including the UK project manager Dr Eric Dunford and Dr Peter Clegg, the resident astronomer at the IRAS ground station throughout the mission. Alan Rodgers, who led the UK operations team also received a Public Service Medal and the rest of the IRAS ground station team shared a NASA Group Achievement Award. Other IRAS teams which included British astronomers also received awards.

The awards to the UK project members were made at the Rutherford Appleton Laboratory on December 13 1984 by the NASA administrator James Beggs and the IRAS project manager Gail Squibb. This followed similar ceremonies in the USA and The Netherlands at which the rest of the team members were honoured. In all five team and ten individual awards were made to the IRAS project and sixty eight Britons were included in the various citations.

The next step

The IRAS mission mapped almost all of the infrared sky, leaving only a few small gaps which could not be filled for operational reasons. In all ninety seven percent of the sky was covered. It will take many years to analyse the huge amounts of data in the IRAS catalogues, but follow up missions are already on the drawing board. NASA is working on SIRTF, the Space InfraRed Telescope Facility which it hopes to launch from the space shuttle in the early 1990s. The final design of SIRTF is not yet complete, it was originally planned as a Spacelab type mission which would stay attached to the shuttle but has recently been transformed into a free flying satellite with provision for in orbit servicing.

More definite is the plan for a European



The IRAS satellite. Length: 3.6 m. Diameter: 1.5 m. Weight: 1,000 kg. Orbit: circular, 900 km high, 14 circuits/day. Plane: perendicular to sun. Telescope: Primary mirror, 60 cm diam. 62 detectors at 12, 25, 60, 100 micrometres. 70 kg liquid helium. Sensitivity: 10^{-18} watts/cm^2 (detect a 60 w bulb at 10,000 miles). Data: transmitted to RAL twice per day 1 m bit/sec for 400 seconds. 301 days. Total data: 2.10^{11} bits (equivalent to 4,000 bibles). Photos: RAL.

Space Agency satellite called the Infrared Space Observatory (ISO). The ISO is similar in size to IRAS but will have a different set of scientific instruments designed to examine infrared sources in much more detail. ISO will have a cooling system similar to IRAS but with various refinements to allow a two year mission life. ISO will be launched by an Ariane rocket about 1992 into a highly elliptical orbit which will allow the satellite to examine any single source for about ten hours, compared to a maximum IRAS observation of approximately eight minutes.

Between now and the mid 1990s infrared astronomers will have to be content with small telescopes flown on the space shuttle to develop the technology required for future missions. For example by the year 2000 there may be large infrared telescopes in orbit being routinely serviced by astronauts from the space station.

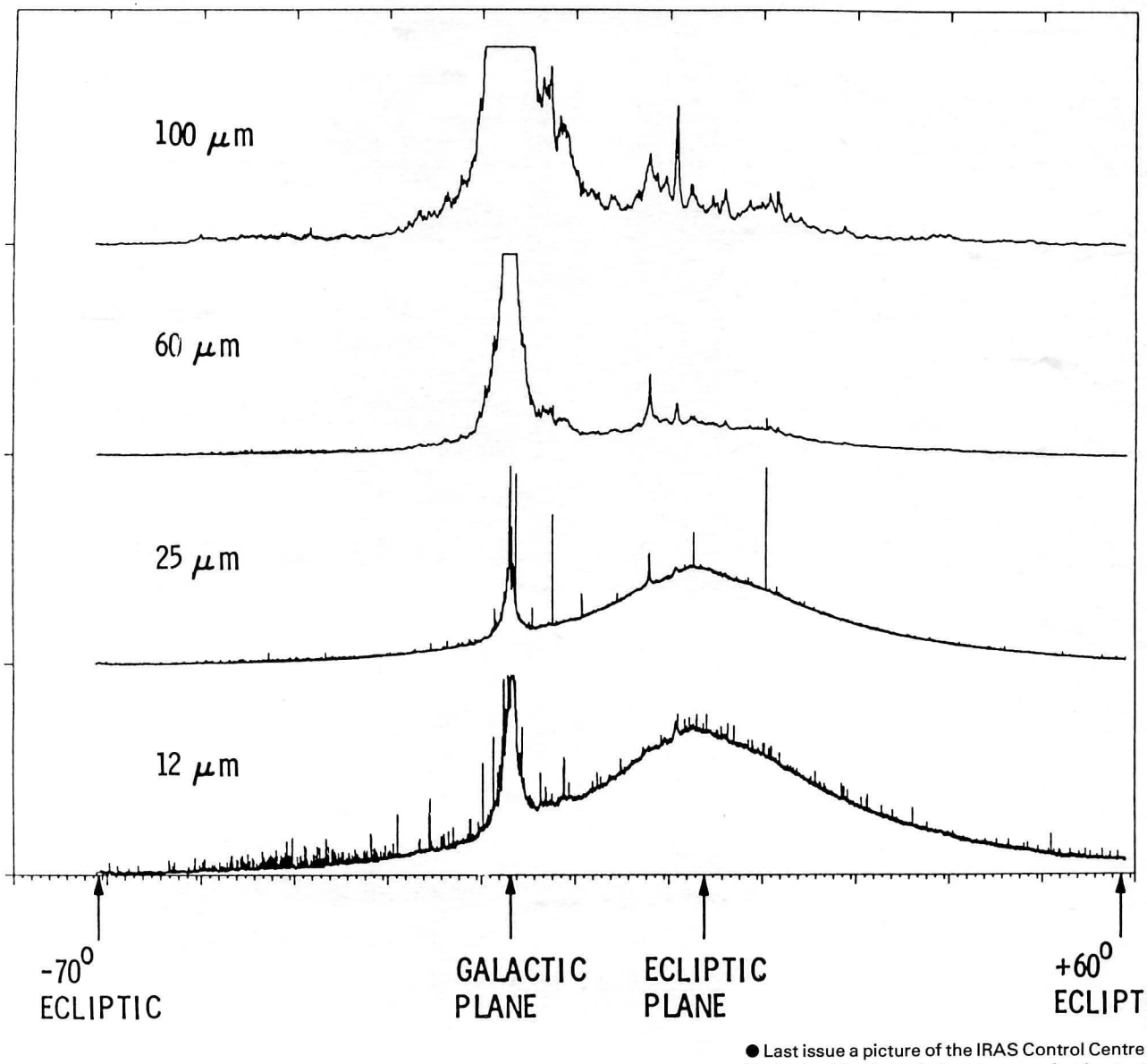
The last decade has seen a revolution in infrared astronomy but with SIRTF, ISO and the space station it is clear that in this exciting area of astronomy the best is yet to come.

Could IRAS be saved

The recent rescue of the satellites Palapa-B and Westar 6, following the spectacular repair of the Solar Maximum Mission spacecraft have inevitably raised the question of reactivating IRAS. After all the satellite itself is undamaged, it was only the lack of helium coolant which ended its mission. Although it may seem comparatively easy to top up IRAS from the Space Shuttle, and the possibility of a rescue mission was discussed, detailed studies showed that it could not be done economically.

One reason is the orbit, IRAS is in a high orbit, over the poles which is out of reach of the Shuttle and, unlike the Palapa-B and Westar 6 satellites, IRAS has no onboard rocket motor which could be used to bring it within range. Secondly, even if it could be reached, IRAS was not designed for in orbit refuelling so it would be necessary to return the satellite to Earth and then modify it for relaunch on the Shuttle. This would take such a long time that it is likely that before IRAS was ready for relaunch it would be overtaken by one of the follow up satellites planned for the early 1990's.

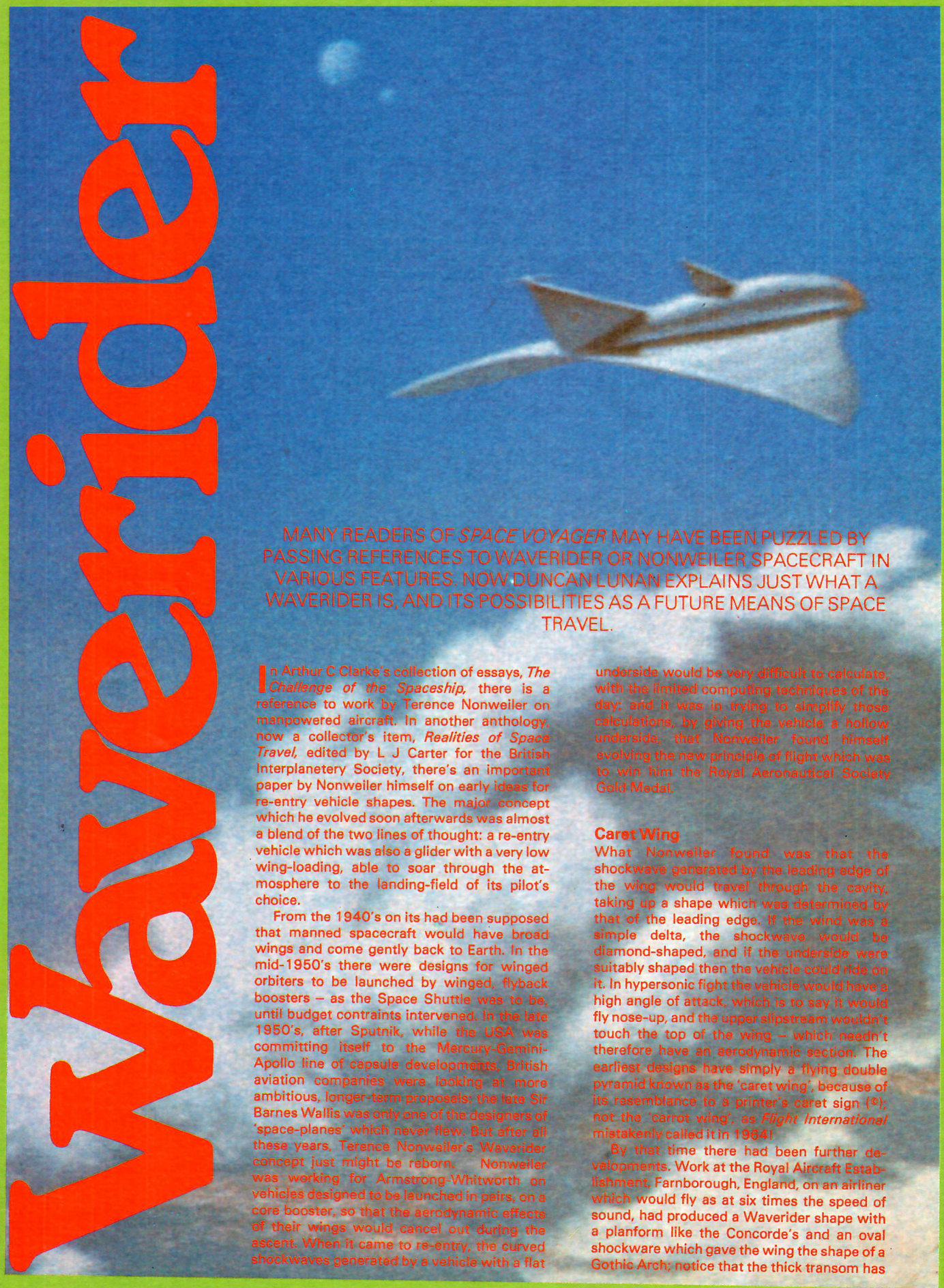
Finally there is another reason why IRAS is not worth trying to re-activate. Its mission is over, the infra-red sky survey IRAS was designed to carry out has been done. There is little to be gained scientifically by repeating the survey, it is better to spend any money which is available on follow up observations of the objects which IRAS discovered and leave the satellite to a well earned retirement.



Infra-red responses at 12, 25, 60 and 100 micrometres (a micrometre is 0.000,001 m).

● Last issue a picture of the IRAS Control Centre at Rutherford Appleton Laboratory was inadvertently captioned as being in the US. We apologise to all concerned – RAL is actually in Didcot, Oxon.

Waverider



MANY READERS OF *SPACE VOYAGER* MAY HAVE BEEN PUZZLED BY PASSING REFERENCES TO WAVERIDER OR NONWEILER SPACECRAFT IN VARIOUS FEATURES. NOW DUNCAN LUNAN EXPLAINS JUST WHAT A WAVERIDER IS, AND ITS POSSIBILITIES AS A FUTURE MEANS OF SPACE TRAVEL.

In Arthur C Clarke's collection of essays, *The Challenge of the Spaceship*, there is a reference to work by Terence Nonweiler on manpowered aircraft. In another anthology, now a collector's item, *Realities of Space Travel*, edited by L J Carter for the British Interplanetery Society, there's an important paper by Nonweiler himself on early ideas for re-entry vehicle shapes. The major concept which he evolved soon afterwards was almost a blend of the two lines of thought: a re-entry vehicle which was also a glider with a very low wing-loading, able to soar through the atmosphere to the landing-field of its pilot's choice.

From the 1940's on its had been supposed that manned spacecraft would have broad wings and come gently back to Earth. In the mid-1950's there were designs for winged orbiters to be launched by winged, flyback boosters – as the Space Shuttle was to be, until budget contraints intervened. In the late 1950's, after Sputnik, while the USA was committing itself to the Mercury-Gemini-Apollo line of capsule developments, British aviation companies were looking at more ambitious, longer-term proposals: the late Sir Barnes Wallis was only one of the designers of 'space-planes' which never flew. But after all these years, Terence Nonweiler's Waverider concept just might be reborn. Nonweiler was working for Armstrong-Whitworth on vehicles designed to be launched in pairs, on a core booster, so that the aerodynamic effects of their wings would cancel out during the ascent. When it came to re-entry, the curved shockwaves generated by a vehicle with a flat underside would be very difficult to calculate, with the limited computing techniques of the day; and it was in trying to simplify those calculations, by giving the vehicle a hollow underside, that Nonweiler found himself evolving the new principle of flight which was to win him the Royal Aeronautical Society Gold Medal.

Caret Wing

What Nonweiler found was that the shockwave generated by the leading edge of the wing would travel through the cavity, taking up a shape which was determined by that of the leading edge. If the wind was a simple delta, the shockwave would be diamond-shaped, and if the underside were suitably shaped then the vehicle could ride on it. In hypersonic fight the vehicle would have a high angle of attack, which is to say it would fly nose-up, and the upper slipstream wouldn't touch the top of the wing – which needn't therefore have an aerodynamic section. The earliest designs have simply a flying double pyramid known as the 'caret wing', because of its resemblance to a printer's caret sign (^), not the 'carrot wing', as *Flight International* mistakenly called it in 1964!

By that time there had been further developments. Work at the Royal Aircraft Establishment, Farnborough, England, on an airliner which would fly as at six times the speed of sound, had produced a Waverider shape with a planform like the Concorde's and an oval shockware which gave the wing the shape of a Gothic Arch; notice that the thick transom has

'disappeared' and a stabiliser fin has 'grown in its place.

Dummy Waveriders, mounted on missle nose-cones at the Woomera rock range in Australia, had confirmed that the Waverider generated lift as predicted; but the concept was so far ahead of its time that little further work was done. Having been Professor of Aerodynamics and Fluid Mechanics at Glasgow University in Scotland, and later Dean of the Faculty of Engineering, Nonweiler emigrated to New Zealand in the 1970's; but he left some Waverider enthusiasts behind.

I am now the President of ASTRA, the Associaton in Scotland to Research into Astronautics, which was originally a Scottish Branch of the British Interplanetary Society. As it happens, the first meeting I ever attended was addressed by Terence Nonweiler. He remained a friend to the society, opening its first meeting rooms in 1970, and in 1973-4 he took part in a major discussion project on the exploration of the Solar System, of which I was chairman. The project continued into the 1980s and was published in two parts, *New Worlds for Old* (William Morrow, Inc., 1979) and *Man and the Planets* (Ashgrove Press, England, 1983; US distribution by Merrymac.)

Along the way it had evolved a new class of planetary space probe mission which we termed 'gliding entry', quite different from the headlong plunge of other types of entry probe. In theory, since the upper surface of the Waverider would not be sheathed in plasma, it might be possible to retain radio contact with it throughout the planetary entry phase. As the fiery slipstream doesn't touch the upper surface in that phase, lander probes could be carried as 'deck cargo' without having to fit within an aero-shell, to be released with precision over their targets.

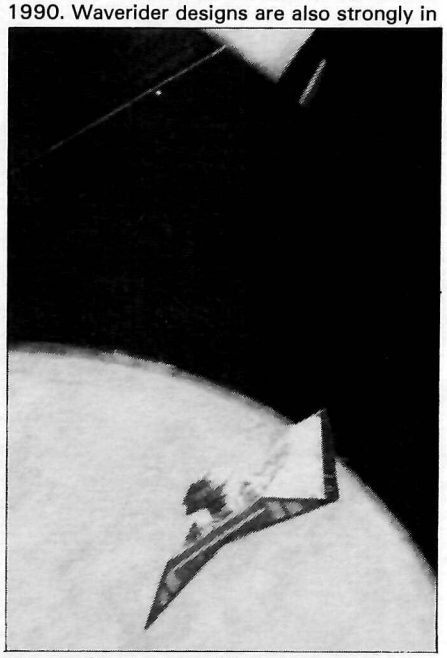
Exciting missions could be devised for the Waverider itself: to fly down the Great Rift on Mars, or spiral down the slopes of Nix Olympica and round the cliffs at its base; to get under the clouds of Venus, as balloon probes cannot do, and down into visual range of the surface, almost hovering in the dense Venusian air; to explore the ionoshpere of Jupiter, which although multi-layered and deep will be penetrated by the Galileo entry probe in just four seconds.

Versatile Craft

Nonweiler predicted that a Waverider could come down from equatorial orbit and land anywhere on Earth, because for the effect to work the craft has to have a very low wing-loading; for the same reason its touchdown speed would be low. Although the Moon Treaty at present before the United Nations is highly controversial, with its insistance that lunar resources are the common property of mankind, when the time does come to exploit the Moon a vehicle which can be built there (the Waverider hull is stainless steel), and landed anywhere on Earth on ordinary runways, could be of great political importance.

In the still longer term, the British Interplanetary Society's 'Project Daedalus' proposed to mine the atmosphere of Jupiter with hot-air balloon factories to fuel interstellar probes. Such resources would also be very important to full-scale development of the Solar System; but to collect them, it would be easier to dock in the lee of a Waverider 'flying factory' than with the underside of a hot-air balloon! Such a vehicle could 'burn' oxygen in the shockwave to generate thrust, and being under power and steerable it would be able to cut through or avoid the extreme turbulence of Jupiter's atmosphere.

I first made these points in a paper given to the L5 Society Conference in London in 1977. The proceedings weren't published, but I had several requests from amateur groups for permission to reprint the paper, so I prepared an updated version which appeared in the Journal of the British Interplanetary Society in January 1982. I pointed out that Nonweiler's original concept was compatible with the European launcher, Ariane, and as a result Waverider designs have been considered for 'Hermes', the European mini-shuttle, which is scheduled for its first launch on Ariane V in 1990. Waverider designs are also strongly in



Above, Caret wing with deck cargo approaches Titan. Painting: Gavin Roberts. Left, Gothic Arch Waverider in Jupiter's atmosphere. Painting: Ed Buckley.

contention for the Post-Hermes vehicle, whose design is expected to be finalised in 1995.

Another exciting development is that ASTRA has formed WASP, the Waverider Aerodynamic Study Programme, whose organisers Gordon Dick and John Bonsor have recapitulated much of the early design work of the 1950s and early '60s in designing Waverider models. A private developer, who for the moment wishes to remain anonymous, has offered WASP a sounding rocket launch in 1986, to reach three times the speed of sound in horizontal flight at 30 km altitude. This ambitious project will put Nonweiler's theories to a dramatic test: on the strength of it Astra has been admitted to membership of the European Youth and Space movement, and will host its biannual conference next year.

American interest

On my most recent visit to the USA, during which I've spoken on these developments at JPL and Ames Research Center, I've learned with interest that there was wind-tunnel research on Waveriders at Ames in the 1960s, and the concept is again arousing interest for interplanetary probes. The feeling seems to be, however, that for Jupiter and Earth at least, it may not be possible to design a Waverider which would be capable both of atmosphere entry and hypersonic light. While that would be a handicap in the short term, when it comes to cargo deliveries to Earth from the Moon, asteroids and later the planets, it needn't be a problem.

In the ASTRA discussions leading to *Man and the Planets,* we set ourselves an exercise picturing Solar System development dispensing with the use of rockets. There are at least four systems currently being discussed in the literature, which would allow Waveriders to bypass high-speed entry: these would be photon sails, electromagnetic braking, laser or electron beam propulsion, or the 'rimless wheel' variety of space elevator.

Any of the first three could slow down incoming cargo Waveriders, or the 'bus' vehicles which carried them (Waveriders have the advantage of being stackable!) for a gentle atmosphere entry; electromagnetic capture, in effect a 'mass driver' working in reverse, would generate energy in the process! A rimless wheel or 'bootstrap' elevator could collect a Waverider on a high-speed approach, and release it gently in the lower atmosphere wihout having to go through a fiery entry. (Charles Sheffield discusses this concept in his book *Vectors*).

Heat problems

Thermal protection is another problem area. The Waverider would be silver or white on the underside, blue-black on top, to absorb as little heat from the shockwave as possible and to radiate as much as possible away. Transferring heat through the vehicle will not be a simple task. There's also the question of the leading edges, which have to withstand temperatures of 1,500 degrees C: that's within the range of the tiles used on the Shuttle's leading edges, but whether they can be made as sharp as the Waverider requires is another question. Erosion by oxidation might be a considerable problem.

In large-scale commercial deliveries, however, Waveriders would normally have to withstand entry only once; and if delivery into the atmosphere is made relatively gentle, by one of the futuristic techniques to be expected in major space industrialisation, then perhaps that problem too will be bypassed.

Thus even if it turns out that Waveriders can't 'live' through all phases of atmosphere entry, as Nonweiler first envisaged, still they may have the great future the ASTRA discussions pictured for them. Manufactured initially on the Moon or the asteroids, and launched electromagnetically – singly, on 'bus vehicles' or in 'trains' – Waveriders would bring cargoes down the gravity well to Earth-orbiting factories or directly to Earth itself. In some cases, the stainless steel of the Waverider hull would be the cargo. In others, as Ian Downie of ASTRA pointed out, they could be fitted with the guidance and power units needed to travel on maglift railway systems, between industrial estates, ports, airfields and cities. In plentiful supply, they would come to be used routinely for cargo transfers of all kinds from the Moon and the asteroids on down: the self-propelled, self-guiding containers of the 21st century.

The INVADERS

Roy Thinnes and Diane Baker in The Invaders.

ALTHOUGH NOT THE BEST KNOWN OF SF SERIES TO REACH OUR SCREENS, *THE INVADERS* IS CERTAINLY ONE OF THE MORE CONTROVERSIAL. GRAEME BASSETT EXAMINES THE SHOW, AND DISCUSSES WHETHER AND WHY THE INVADERS WENT WRONG.

Until the producers insisted on a happy ending, the 1956 film *Invasion of the Bodysnatchers,* closed with a shot of Kevin McCarthy staggering down a highway, in a vain attempt to flag down the passing automobiles as their motors drowned out his cries of, 'They're coming! They're coming!'

At least, that's how the story goes, and the image is so powerful that no-one has ever seriously contradicted it. Ten years later, another man would start running, and his warnings would also be ignored. This time, the ABC television network demanded nothing less than a long running television series out of the concept, and although *The Invaders* is usually relegated to the position of jester in TV SF's hall of fame the series had its moment of glory.

Larry Cohen's original idea had been to set up a half-hour thriller serial about humanoid invaders who needed constant recharging in order to hold onto their innocuous-looking form. Although now known as the producer/writer/director of such cult successes as *It's Alive* and *Q – The Winged Serpent,* Cohen was then just a young writer, and when ABC called in Quinn Martin Productions to make the pilot film, he gradually realised that control was slipping from him.

Since QM Productions had already given ABC one long-running success with *The Fugitive* it probably seemed a sensible idea to forget the idea of a serial, instead expanding *The Invaders* to the same 50 minute, man-on-the-run format. Certainly, QM outfitted the stiff little fingered aliens with an eye-catching array of gadgets, including the hand-held execution disk and the incinerating triggerless scanner gun.

The First wave

The 90-minute pilot film (made for ABC's private use, but later edited down to 50 minutes as the first episode, *Beach-Head*) was

written by Anthony Wilson and directed by Joseph Sargent (who made that *Star Trek* exercise in deception and hysteria *The Corbomite Manoeuvre*). Powerful enough to have appeared in ABC's earlier anthology series, *The Outer Limits* this episode keeps the viewer wondering what's going on, even though we've seen the UFO land, and know there's something suspicious about the honeymooners with the glowing faces and stiff little fingers.

At one point, David Vincent wakes up in a hospital bed and panics when he notices another man's ID on his wrist. It could be a simple mistake, but as Vincent tries to get out of his private room curiously blank-faced orderlies move in to restrain him. As Vincent screams and writhes out into the corridor his partner and the local police lieutenant watch in amazement. The scene is over so quickly that we're left wondering if it's part of the alien plot or if David really is nuts.

J D Cannon, playing the lawman takes no chances when he finds Vincent examining the body of his murdered partner. Canon whacks David over the head, explaining to the local aliens that Vincent is, 'just a sick man'.

On the strength of this film, ABC decided the show was worth buying, and so condemned David Vincent to a precarious life on the road. He becomes a minor celebrity. . .a joke. . .a target; in *The Mutation,* two men offer to show Vincent where they saw a UFO land. They drive him out into the desert, then cheerfully beat and rob him. Always, the aliens are one jump ahead, waiting to silence him, in true conspiracy-theory fashion. But Vincent keeps on shouting his warning: 'I've written. I've talked. I've phoned. I've seen Senators. . . Congressmen. . .I've given up my life to fight them.'

One man show

Possibly the shows only consistent asset, Roy Thinnes played Vincent for thirty episodes without co-star or supporting cast. Props may get broken, and there were only a number of times the shot of the Flying Saucer could be reworked, but as long as the series lasted Thinnes was incisive, exasperated and suspicious; seething with neurotic energy, and behaving as if he really was in the grip of an obsession.

Towards the end of 1967, the viewers began to get bored. In terror of falling audience figures, Producer Alan A Armer ordered a slight change in format. The stories were no different, but *The Believers* introduced Kent Smith as Edgar Scoville, a cuddly old industrialist who served a double function. Not only did Scoville give the viewers a sympathetic character to identify with, he also introduced Vincent to an underground network of scientists, military men and other 'believers' who opposed the aliens.

Presumably, this change in format was so hastily assembled that no-one realised how subversive the new development was. Here we had this group of malcontents, ignoring the civil authorities, running around with guns, jamming radio signals, murdering, kidnapping . . .and led by a known eccentric. One memorable episode, *The Organisation,* even has Vincent teaming up with a gangster (J D Cannon again) to rub out the Invaders.

Bizarre though these undertones were, they didn't compensate for the general lack of imagination in the stories, and the show was finally cancelled in early 1968. Unlike *The Fugitive* whose success had earned it the luxury of a planned ending, *The Invaders* disappeared without a conclusion.

Jack Lord, left, plays George Vikor, a wealthy industrialist who falls under the power of the aliens, led by the evil Nexus (Alfred Ryder) in the episode 'Vikor'.

Standard fare

Although it's always easy to speak with hindsight, the manner in which the show ended illustrates the fundamental problem with this show. Alan Armer claimed that his intent was, 'to scare the pants off America'. Well, that's fine, if you're working on an *Alfred Hitchcock Presents* type anthology programme, and it's a credible ambition if you're producing a serial; its plot twisting like a maze with each climax the clang of a trap slamming shut but *The Invaders* was a standard American adventure series with all the peculiarities of its ilk. The episodes could be shown out of order without confusing the casual viewer, which means that there could be no troubling references to characters or events from earlier stories. Each day was really the first day of the rest of David Vincent's life – a problem would be introduced and resolved within the space of fifty minutes. And, of course, there would be 'action' to stop the viewers getting bored – so this advanced alien race, looking for all the world as if they'd strolled across from the set of Quinn Martin's long-running *The FBI,* would ambush Vincent with revolvers and shotguns.

Obviously, this lack of proper structure seriously diminished Armers chance of terrifying this audience from the outset. Yet even so, the programme could have thrilled the viewers if it hadn't been so resistant to those brief moments of imaginative power which did surface.

Although an alien warns Vincent in the first episode that, 'Some of us learn, We're learning all the time' and Suzanne Pleshette twice played Invaders who were confused by human emotions, the majority of the aliens were played as soul-less stereotypes.

Michael Rennie, the sympathetic spaceman of *Day the Earth Stood Still* presides over a Ray Bradbury type sequence of *The Innocent* in which Vincent is re-united with his loved ones in an idealised small town; but the idea is thrown away in favour of more cops and robbers stuff. (If QM had produced *The*

Prisoner, Number Six would probably have escaped from the Village during the second Act).

In *Quantity Unknown,* James Whitmore is superb as a nutter who will go to any lengths to defeat the aliens. . .even murdering humans. . .but of course, rather than cast any reflection on the sort of company Vincent keeps, the last act reveals that Whitmore is an Invader and it's all part of a plot to remove Vincent.

This isn't to suggest that there were never good stories to be found. After the 'believers' were introduced Robert Sabaroff and William Blinn wrote an episode called *The Vise* in which Vincent has to convince a black investigator that Roscoe Lee Browne is unfit for a post in the Space Agency because he's an alien, although his appointment would be a morale booster for the negro community. Vincent eventually sways the investigator by asking if he's ever noticed that Browne's plams are as black as the rest of his body.

Cinematographic skills

Many of the better episodes were directed by Paul Wendkos, who lent menace to the most innocent of surroundings with his low key lighting, bizarre camera-angles and close-ups. In *The Leeches* by Dan Ullman, Wendkos brings the best out of one of the few scripts which concerned itself with more than just the surface elements. The theme of trust runs heavily through this episode as electronics expert Arthur Hill asks Vincent to help avert an alien kidnap plot. The eventual plan is that Hill will let himself be snatched by the Invaders so that a homing device can be smuggled into their hideout. Of course, the plan goes wrong, and the homing device is knocked out before Vincent can locate the mine where the aliens are hiding.

The underrated Mark Richman plays Hill's best friend and security chief. As he and Vincent search the desert for clues, Richman admits that he loves Hill's wife and guiltily announces that he's calling off the 'pointless' search. Vincent stays, and when the aliens set up an ambush he's only saved by Richman, whose conscience won't let him leave.

Together, they track down the alien hide-out, incinerate most of the aliens and rescue their captives. The mine begins to collapse, and Richman is buried under falling rubble. What makes the ending so memorable is not that Richman dies, but that he does so bellowing Vincent's name. It's a cry of pure terror, but in the context of the story it's a cry of accusation. Vincent's let someone down again, and this time he can't put it right.

Spin-offs

A moderately successful show, *The Invaders* had its share of commercial spin-offs. **Aurora** produced an authentic plastic UFO kit, and **Gold Key** published four relatively faithful comic-books with likenesses of Thinnes and Kent Smith by the excellent Dan Spiegle. Finally, there was a very strange novel written under a pseudonym by Keith Laumer. *The Halo Highway* introduces alien bodysnatchers who bear more resemblence to the Mysterons from *Captain Scarlet* than the TV *Invaders,* and also makes Vincent a mouthpiece for curious 'individualist' philosophy rather than a character in his own right.

The Invaders is often held up as an example of much that is wrong with TV fantasy, and in a way I suspect this illustrates the gap in understanding between programme makers and one particular section of their audience. QM Productions thought their ray guns and flying saucer were enough to captivate the 'younger audience'. The fans felt the show was disappointingly level-headed. Yet ITV grabbed *The Invaders* in 1967. The BBC didn't bother to show *Star Trek* until 1969. Were pointed ears and phasers considered too bizarre for a British audience? Did the men in black tacky suits with their stiff little fingers represent the acceptable face of SF on TV?

Above, Roy Thinnes steadies Diane Baker as they uncover some of the aliens' deadly machinery in the first episode, 'Beach-head'. Right, General Concannon (James Daly) and his wife, Sarah (Phyllis Thaxter) help to arrange a meeting between Vincent and the alien leaders to discuss possible co-existence terms in 'The Peacemakers'. **Photos: Worldvision Enterprises Inc.**

For your INFORMATION

ROG PEYTON ANSWERS SOME MORE OF YOUR QUESTIONS ON SF AND FANTASY BOOKS.

In my first column in Issue 13, David Ray asked if there were any books from the TV series *The Invaders.* I gave details of the three books I knew of. Several readers have written in pointing out two other books I had omitted. Researching the subject further, I found that the series of books has a very peculiar history indeed! The first book was *The Invaders* by Keith Laumer (Pyramid R1664, USA, 1967) which was reprinted in the UK not only with the title changed, but the author's name as well! The book was issued over here as *The Meteor Men* by Anthony Lebaron (Corgi GS7836, 1968). It was the *second* in the series over here! The correct second book was *Enemies from Beyond* by Keith Laumer (Pyramid X1689, USA, 1967). That didn't get published in the UK at all. Book three was *Army of the Undead* by Rafe Bernard (Pyramid R1711, USA, 1967) which was the *first* book published in the UK but, again, the title was changed. It became *The Halo Highway* (Corgi GS7742, 1967). As far as the US was concerned that was the complete story. But over here in the UK, two further books appeared – *The Night of the Trilobites* (Corgi 07879, 1968) and *The Autumn Accelerator* (Corgi 08085, 1968). Both were written by Peter Leslie, neither of them appeared in the US. It should be noted, I hasten to add, that *none* of them were adaptations of TV scripts – all five books were original plots using *The Invaders* title, lead character and general basic plot. Some of them weren't even set in the USA.

Now that, I'm sure, is the complete story of *The Invaders* books, but if anyone out there has any additional info, I'd be more than pleased to hear from them.

In the same column, I also mentioned a sixth book in the second series of *Space 1999* and stated that this never appeared. One of my sources lists *The Edge of the Infinite* by Michael Butterworth as having been published and actually gives the publishing history as Warner Books 88-346, 1977. One other source states that it definitely did *not* appear. Anyone out there own a copy?

And so on to this issue's crop of questions...

I have recently read two SF anthologies and discovered an author I like called Raymond Z Gallun. My local library lists nothing. Can you please tell me if he has written any novels and if there are any other short stories – in fact, can you tell me *anything* about this author?

R E Chapman,
Bury St Edmunds

Excuse me while I brush the dust off several weighty tomes from the archives – we really do go way back for this one! Raymond Zinke Gallun was born in Wisconsin USA on March 22, 1911 (or 1910, depending on which source you believe) and published his first SF stories *The Space Dwellers* in the November 1929 issue of *Science Wonder Stories* and *The Crystal Ray* in the November 1929 issue of *Air Wonder Stories.* Over the next 15 years he published over 70 stories mainly for *Astounding* when edited by F Orlin Tremaine, including several stories under the pseudonyms Arthur Allport, William Callahan, Dow Elstar and E V Raymond.

In 1940 his first book was published – *The Machine That Thought* under the pseudonym William Callahan (Columbia Books, New York). This was a collection of short stories.

The war curtailed his writing and nothing appeared from 1943 until 1949. Some two dozen stories appeared between 1949 and 1956. His first novel appeared in 1957 – *People Minus X* (Simon & Schuster, New York; Ace D291, New York 1958). His second novel was *The Planet Strappers* (Pyramid G658, New York, 1961). Nothing else appeared until the very late '60s when a few short stories were published. His third novel *The Eden Cycle* (Ballantine 24255) appeared in 1974.

In 1978, Ballantine published *The Best of Raymond Z Gallun* edited by J J Pierce, a collection of 13 stories including his most famous story *Old Faithful* from 1934. A fourth novel appeared from Tower books (51682) in 1981 called *Sky Climber,* making only six books published in just over 50 years!

All of the above books are out of print, though you might find second-hand copies of *The Planet Strappers* hanging around as this was the only one of his books distributed officially in the UK.

I've just read Kathleen Sky's two *Star Trek* novels *Vulcan* and *Death's Angel* and would like to read anything else she has written. Can you tell me if there is anything, please?

Christine Jones,
Hull

Kathleen Sky wrote two books before the *Star Trek* pair – *Birthright* (Laser 14, Toronto, 1975) and *Ice Prison* (Laser 38, Toronto, 1976). She is married to another *Star Trek* author, Stephen Goldin, and has reportedly been a freelance writer since 1968. This would suggest that there are either numerous short stories or that she has written under pseudonyms that she prefers to keep secret.

In recent years she has been working on a fantasy trilogy, the first volume of which is called *Witchdame* and has just appeared in America.

I occasionally see references on books, such as 'Hugo Award winner' or 'Nebula Award winner'. What are these and how are they awarded?

Stephen Wells,
Nottingham

The Hugo Award is named after Hugo Gernsback who started the first science fiction magazine, *Amazing Stories,* in 1926. The first Hugo Award was presented at the World SF Convention in 1953 to Alfred Bester for his now-classic novel *The Demolished Man.* Winners in each category (novel, short story, artist, editor, etc) are chosen by fans and readers who are members of each World SF convention, usually held in America. Anyone can register for these conventions without having to attend. There is a complicated system of nominations and 'order of preference' voting far too lengthy to report here. The Hugo is the SF equivalent of Hollywood's Oscar.

The Nebula Award is presented by the Science Fiction Writers of America – membership of which is restricted to published writers. The Award was first presented in 1966 to Frank Herbert for *Dune.*

Voting for the Nebula Award is by members of SFWA only and, again, is on a nomination and final ballot system. The Nebula is funded by publishing a collection of the winning short fiction each year.

Neither system is perfect – certainly both awards have received criticism over the years. The main criticism of the Hugo is that it is awarded by fans, many of whom have no literary criteria – they simply vote for their favourite, while the Nebula has received criticism because publishers send free copies of certain books to every SFWA member requesting their support – thereby ending up with a system that awards the most publicised book. Fortunately there are many authors who keep in touch with the field as a whole by reading reviews and then selecting their own reading material but, on the other hand, there are authors who only read books that are sent to them free by publishers.

My own view is that awards are necessary – after all, most of the people who are responsible for distributing/selling SF books have no knowledge of the field and that little extra line – Hugo Award Winner – can do a lot to help sales and improve the position of SF. As to whether that particular book *is* the 'best' ... there is no real unarguable answer to that. If the awards aren't perfect then positive action should be taken to improve the system.

NIGHT SKY

DUNCAN LUNAN TELLS US WHAT MAY BE SEEN IN THE HEAVENS DURING MAY AND JUNE.

MAY

The planet *Mercury* is at maximum elongation (furthest apparent distance from the Sun) in the morning sky on the first of May, but because it's far south of the celestial equator, it is favourably placed only for observers in the southern hemisphere. In the UK it will rise only half an hour before the Sun, probably too late to be seen.

Venus on the other hand, after its unusual conjunction with the Sun last month, is already bright in the morning sky and reaches greatest brilliancy on the 9th. The Moon will pass near it on the 16th.

Mars may still be glimpsed in the evening sky for an hour after sunset, and will be 2 degrees (about a finger's breadth, at arm's length) south of the crescent Moon on the 21st.

Jupiter is now prominent in the morning sky in Capricornus, brighter at magnitude – 2.0 than any star. The Moon appears near it on the 11th.

Saturn comes to opposition on the 15th, as the Earth passes between it and the Sun. Saturn will then be due south at midnight (GMT), and because it travels so much more slowly in its orbit than Earth does, it seems at this time to be moving backwards (retrograde) in the sky, east to west, from night to night.

Uranus, south of Ophiucus, is now on the south-eastern edge of our 9 pm map. *Neptune* now rises at 11 pm in Sagittarius.

On May 19 there is a partial eclipse of the Sun, visible only in high northern latitudes (only northern Scandinavia, in Europe). It will not be seen as total anywhere on Earth.

JUNE

The planet *Mercury* passes on the far side of the Sun (superior conjunction) on June 7. By late June it has reappeared and become much brighter, setting an hour after the Sun, but is unlikely to be visible in the prolonged summer twilight of the UK. Further south the prospects of seeing Mercury are better; in fact *Sky & Telescope*, writing for oberservers in the USA, describes the June-July apparition of Mercury as 'rather good'.

Venus is brilliant in the morning sky, reaching its greatest elongation from the Sun on the 12th, and rising about two hours before it. The Moon passes near *Venus* on the 14th.

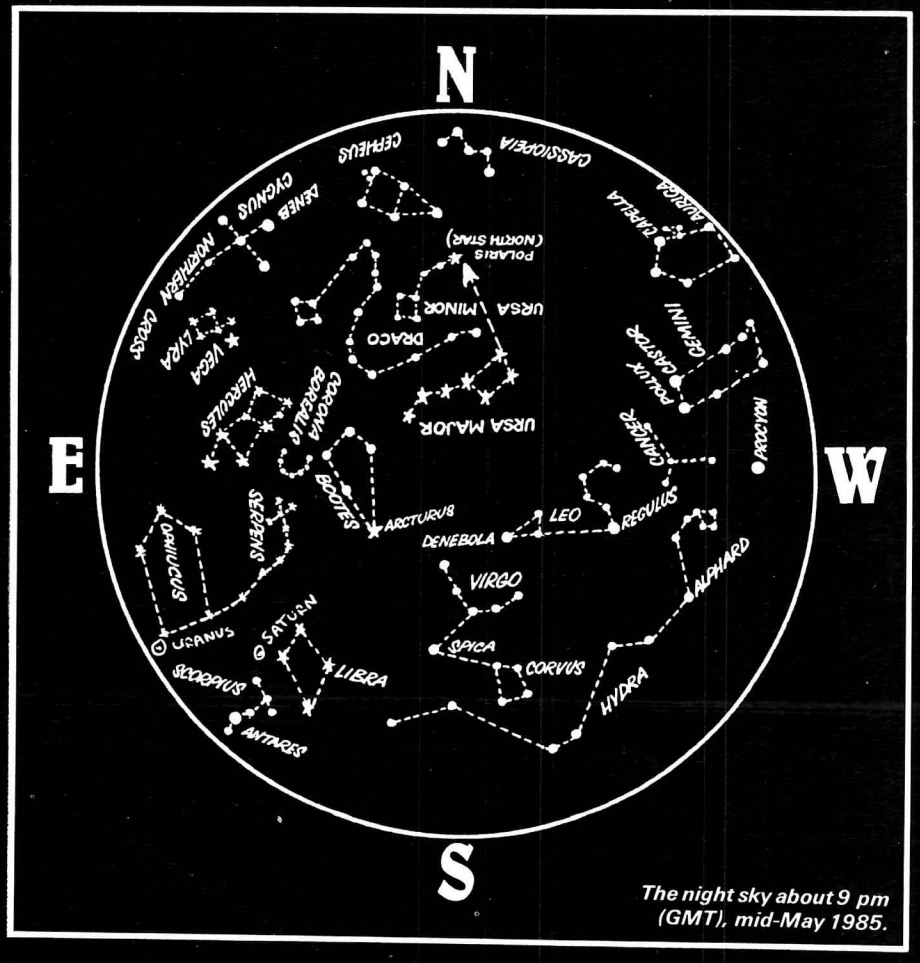
Mars is still in the early evening sky but will not be visible in the UK twilight.

Jupiter now rises before midnight (GMT) and will be a bright object in the morning sky, though low down as seen from the UK, as it was last summer. The Moon appears near Jupiter on the 7th and 8th.

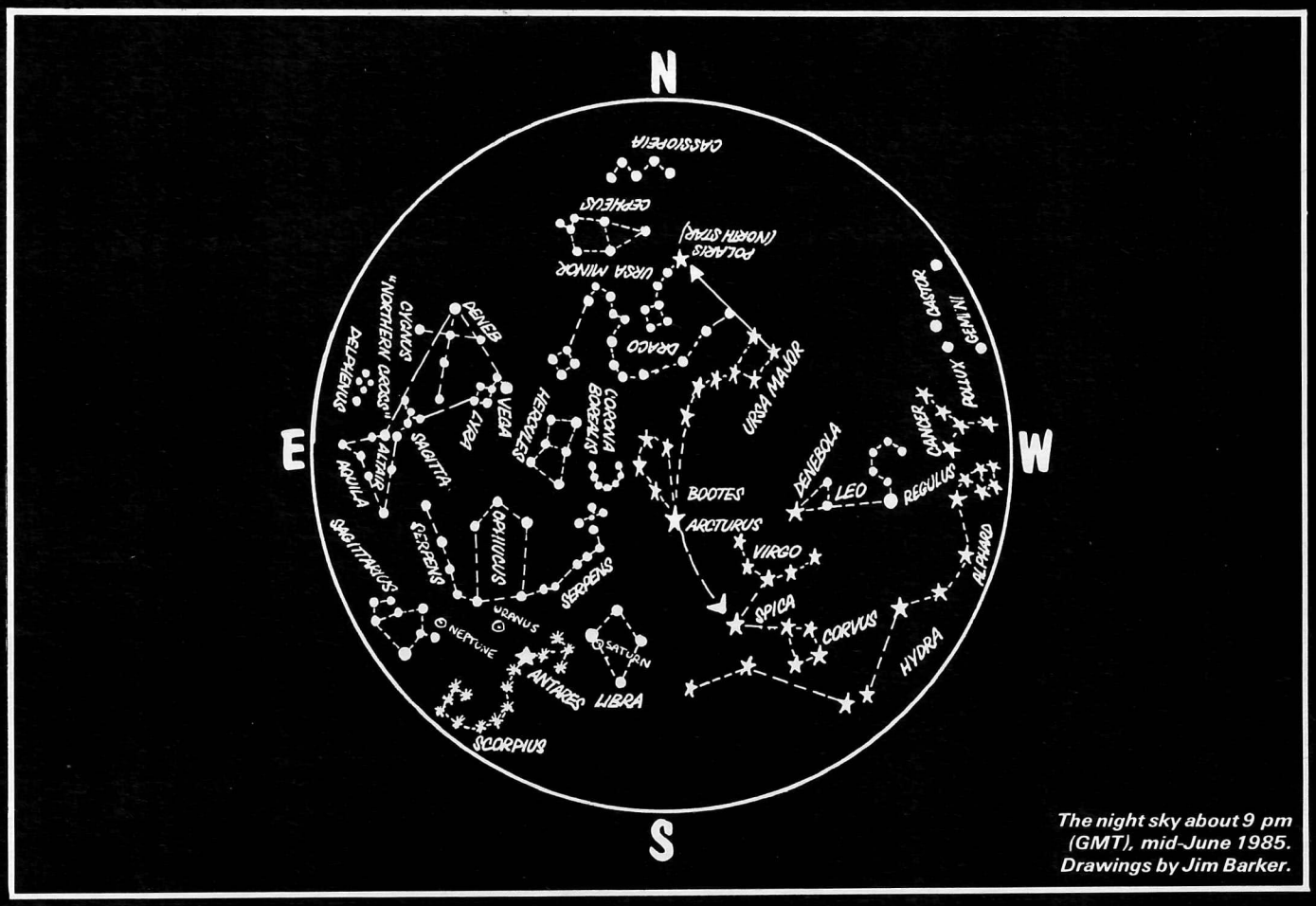
Saturn, in Libra, is visible throughout the evening and well into the morning hours, though it is too low in the sky from British latitudes.

Uranus comes to opposition, due south at midnight GMT, on the 6th. At its closest to Earth for the year, it will be under intensive study in anticipation of the flyby by the Voyager 2 spacecraft next January. On the 25th a faint star will be occulated as the rings of Uranus pass in front of it, and major observatories will be watching to obtain details of the ring structure and to search for nearby satellites. As Uranus is near the bright star Antares in Scorpio, however, it will be very low down in the UK sky and probably invisible from Scotland except from high ground or over a sea horizon. The same applies to *Neptune*, which comes to opposition on the 23rd. The effect of latitude at this season is very marked: in Scotland it's never truly dark during June and July, whereas in California (as I reported last year) it's fully dark and the planets are high in the southern sky by 9 pm local time.

The Ophiucid meteor shower is at its peak on June 19.



The night sky about 9 pm (GMT), mid-May 1985.



The night sky about 9 pm (GMT), mid-June 1985. Drawings by Jim Barker.

CONTRIBUTOR'S GUIDELINES

or

How to get into print in five easy lessons

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2. You should send all the illustrations necessary (the more the merrier) with the article. Drawings need not be works of art – the Voyager drawing office will probably redraw them anyway. Photographic images can be either prints or transparencies, colour or black and white.
3. You must be the copyright owner of all the material submitted or have obtained whatever clearances are necessary for publication.
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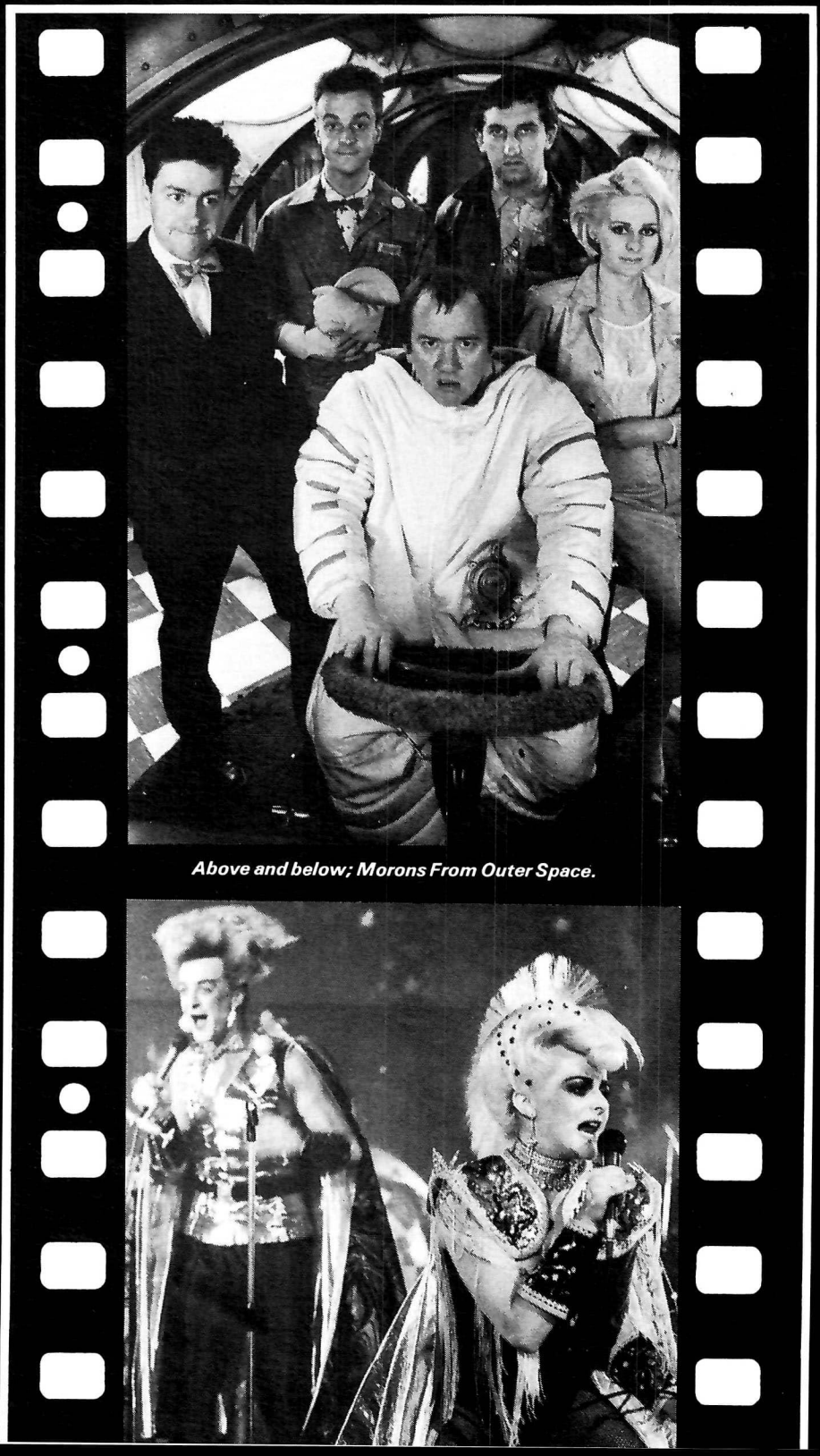
NEIL GAIMAN, INTERVIEWER AND AUTHOR EXTRAORDINARY, BEGINS A NEW REGULAR DEPARTMENT, REVIEWING THE UP-AND-COMING FILMS AT THE CINEMA.

To start with the best: *Brazil* is one of the best science fiction films I've ever seen – intelligent, well-scripted, marvellously acted and with an overall vision that is purely its own. In essence the plot concerns Sam Lowry (Jonothan Pryce), who works for the Central Services in a bureaucratic job but who has nightly dreams of flying, winged, after a beautiful girl in the sky. His boss, Kurtzman, depends upon him, and his life is quiet and organised until the day he sees a girl named Jill Layton (Kim Greist), and recognises her as the girl of his dreams.

Jill is being sought by the Ministry of Information Retrieval, she is causing trouble by complaining about her next door neighbour, Mr Buttle, who was killed by the Ministry in mistake for freelance air-conditioning repairman Harry Tuttle (Robert de Niro). In order to find Jill and save her – and convince her that she needs saving – Sam Lowry gets a promotion, engineered by his rich mother (Katherine Helmond) to Information Retrieval, where Sam's old friend, smiling father-of-triplets Jack Lint (Michael Palin) works as a torturer.

Everything is stacked against Sam: bureaucracy, his apartment's air-conditioning, his mother (and her plastic surgeon, played by Jim Broadbent), even the girl. Can he beat the system and reach his dream?

Terry Gilliam has created in *Brazil* (the title refers to a Thirties song about love and getting away from it all, not the country) an alternate world, drawing on all periods of the twentieth century for background including Orwell's *1984*. It's a world of nightmare, in which reality and fantasy blend brilliantly: in which random acts of terrorism occur without disturbing the diners in a restaurant; ducts and pipes loop through the film like intestines; in which cinematic conventions and reality blend and mix into what may well be the most imaginative film of the last few years. Funny, horrifying and visionary – often all at the same time. It may not be everybody's cup of tea, but it was certainly mine.



Above and below; Morons From Outer Space.

2010

2010 is director/producer/cameraman/scriptwriter Peter Hyam's adaptation of Arthur C Clarke's sequel to Kubrick and Clarke's film *2001: A Space Odyssey*. It resolves some of the questions raised by the first film – why super-computer HAL went crazynasty, for one – but others are still left to the imagination. It lacks *2001's* panoramic view and sense of wonder, replacing it with a fast moving nuts and bolts space adventure. A joint Russian/American expedition is sent out to find what happened to the Discovery, and to discover what happened to David Bowman (Keir

Dullea) and HAL 9000.

Personally I found the ending sickly-sweet and unlikely, as the growing threat of nuclear war is stopped by the monoliths, but leaving that aside I enjoyed it. Roy Scheider and John Lithgow turn out especially strong performances (Lithgow's fear of heights space-walk is probably the film's strongest scene), and Keir Dullea's David Bowman somehow looks unchanged, as he re-enacts the seven ages of man at random, and visits his mother and ex-wife back on Earth.

2010 will never be the cult success that *2001* was; Peter Hyams isn't Stanley Kubrick, but to his credit he doesn't try to be Stanley Kubrick. The film is fun, fast-moving and scientifically plausible. Also interesting to see the old all-white discovery sets again, to hear Douglas Rain play HAL again, and to hear those old musical numbers – *Thus Spake Zarathustra* has still got pizzaz. I enjoyed it and so did the preview audience – although there were a lot of moans about the ending.

Neverending Story

The Neverending Story was not my kind of movie at all. It's the saccharine story of a little boy whose mother has died and whose father tells him in a dubbed American accent to get his head out of the clouds. Nasty kiddies bully him on the way to school, so he hides in an antique shop and rips off a book (*The Neverending Story*) which he hides in the spooky school attic to read.

The story in the book concerns the land of Fantasia which is menaced by the Nothing and only a 10-year-old named Atreyu can save Fantasia and its fairytale inhabitants. Atreyu sets off and has lots of adventures and . . .

I'm sorry. I don't feel at all well.

. . . anyway, after a number of pointless adventures and meetings with various creatures, none of which has any relevance to the plot, Fantasia is destroyed and Bastian (the kid who stole the book, remember?) is able to save it by calling the child-Empress of Fantasia Moonchild after his dead mother. Then he rides off on this dragon that looks like a poodle and scares the bejasus out of the bullies.

I love fantasy. I really do. I couldn't stand this though: it looks cheap, the plot is awful, it's moralistic and preachy (in all the wrong ways). Awful. Horrible. Dreadful. Don't go and see it.

(In fairness I should admit that the two children at the preview *did* enjoy it. I think your best bet would be to take a small child to *Neverending Story* if there's nothing by Disney around in the holidays.)

Morons

Morons from Outer Space (PG) is a 'funny science fiction satire adventure' film. I don't hate it as much as most of the other critics and journalists who've seen it: I laughed about four times, thought a few of the special effects endearing though cheap, checked my watch twice, was unimpressed by the attempts to make it appear that the Ashdown Forest was America (they don't look that similar) and would have felt severely disgruntled had I actually had to pay to see it. But I didn't hate it.

The plot concerns four rather stupid aliens from the planet Blob, on holiday in a decrepit and naff spaceship they've rented, which they crash on the M1. Three of them become media stars after being investigated and hunted by the Government, the other wanders around America trying to convince people that he is in fact the fourth alien.

It was written by and stars Mel Smith (who plays Bernard, the not-as-moronic-as-the-other-three-aliens whom nobody believes) and Griff Rhys Jones as Graham Sweetley, a useless news reporter who becomes the aliens' business manager and elevates them to megastardom. Nothing in the film seems properly thought out. Even the basic premise – that one doesn't have to know how something works in order to operate it, and there is no reason to assume that aliens will be any nicer, cleverer, wiser, more or less warlike etc than ourselves – is thrown away. And properly handled it could be quite funny.

Basically a film for people who think that the sight of a spaceship with fuzzy giant orange dice hanging in the windscreen is sidesplittingly funny. If you don't then give it a miss.

I saw an advance screening the other day of *Ghoulies.* I don't know when it'll be released, I've heard almost nothing about it, and all that I had heard before seeing it led me to believe it would just be a cheap n' nasty *Gremlins* rip-off. It isn't – it's wonderful. Imagine a Disney remake of Hammer's *The Devil Rides Out,* or *The Fall Of The House of the Muppets of Usher,* and you'll have some idea.

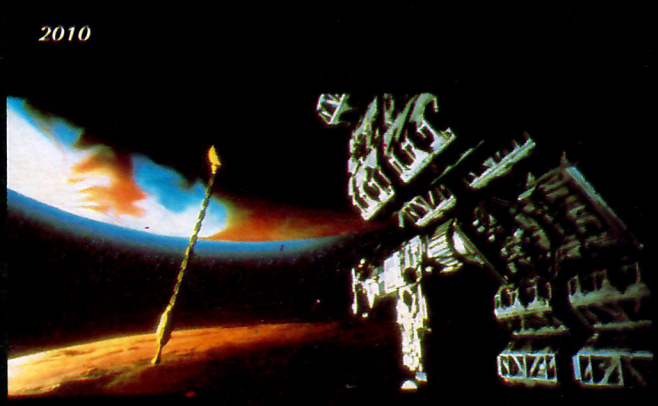
John Lithgow combats vertigo to reach the Discovery. **Photo: MGM/UA.**

An eighteen-year-old inherits his late father's house; he moves in with his girlfriend and soon invites friends around for a party – and the final party game they play is a conjuration of an evil spirit, a ghoulie. Apparently nothing happens. But soon his infatuation with magic has taken the boy over and he's populated the house with invisible (to everybody else except us) critturs, most of them little muppetty gargoyles of various designs, and a couple of hairy-eared gnomes named Grizzle and Greediguts.

But are the forces of evil taking him over? Is his father still in his grave, and if so will he stay there for long? And as people start getting killed, in a variety of technicolour ways, we start to wonder whose side the ghoulies are on.

It's the sort of good-humoured, comic-book splattery movie I would have loved to have seen as a kid: I would have had nightmares for a month but I would have loved it. I've no idea what certificate it's going to get, but if you're old enough to see it, then don't hesitate to pop out and buy your ticket and popcorn when this one is playing. Wittily scripted, nicely shot – it even has a great score. Who says low-budget horror has to be rotten?

Brazil



2010

Brazil

MIDDLE ANDERSON

MANY PEOPLE, EVEN THOSE WHO DENY BEING SF FANS, WILL SMILE WHEN THEY HERE THE WORDS 'FAB' OR 'THUNDERBIRDS ARE GO!' DAVID NIGHTINGALE EXAMINES THE 'GOLDEN AGE' OF ANDERSON, INCLUDING HIS MOST FAMOUS PUPPET CREATION.

Mention *Thunderbirds* to anyone aged between 20 and 30 and you'll get some sort of reaction, even if it is only a mocking of it in some smoky hostelry late on a Saturday night. The point is, of course, that the series *is* remembered and made such an impact on a whole generation in the mid-1960s. What exactly the special magic of *Thunderbirds* was even the man responsible cannot say. Gerry Anderson admits he would have duplicated it many times had he been able to put his finger on it, but it is no secret that the formula has never been fully identified.

What is in no doubt is that the 32 episodes concerning the adventures of the International Rescue organisation were, artistically and commercially, the pinnacle of Anderson's puppet film career to date. The success of *Stingray,* both in the UK and importantly abroad as well, had ensured further funding from Lew Grade and *Thunderbirds* was born as a half-hour programme. In fact nine scripts had been written and five episodes actually shot before Grade first caught sight of the series and responded to his 'gut reaction' by ordering an uprating to an hour-long format; remember this was the man who would later, in effect, give Patrick McGoohan blank cheques to develop 'The Prisoner' without ever fully understanding it! The irony is that when the new Anderson show was screened in America it was chopped down again to half-hour installments!

The decision presented problems for AP Films as they had to continue shooting from existing half-hour scripts even though they knew the episodes would have to be expanded later. It was only from episode 10 that purpose-written hour-long scripts were available. Anderson has said his production schedule never recovered from this jolt as the first episodes had to be altered progressively with additional footage concerning minor plot diversions (such as feeble rescue attempts prior to a call for International Rescue's aid) or alternatively exercises in character and background development. This often necessitated the re-use of models which had already been destroyed (both on-screen and off) which was another headache for effects supremo Derek Meddings.

It is with this man that a lot of credit for the success of *Thunderbirds* lies. Not only did the extra funding (£22,000) per hour allow for elaborate effects, but his basic design work in creating the five main Thunderbird machines (as well as many of the ancillary vehicles) in such memorable style fired the imagination. It was a popular piece of press at the time that officials from military organisations around the world watched the programme hoping to glean some germ of an idea for future hardware. It might not necessarily be such an absurd thought as Gerry Anderson recalls vividly his visit to British Aerospace just prior to the maiden flight of Concorde when his role as *Thunderbirds* producer became known and the technicians waxed lyrical about the series, even saying they had sat down to work out just how it was possible for Thunderbird 2 to fly!

So what was it all about? International Rescue was set up by ex-astronaut Jeff Tracy to act as a last minute saviour for people in distress where all other agencies had failed. His ideas were put into practice by a young genius known simply as Brains, who designed five main Thunderbird craft to perform the rescues. These were built in parts by various engineering companies around the world and then assembled on the remote Tracy island in the Pacific.

The craft, whose hangars were cunningly concealed within the island, were each piloted by one of Jeff's sons. Scott Tracy handled Thunderbird 1, the sleek and amazingly fast scout aircraft; Virgil was responsible for Thunderbird 2, which was a heavy transport aircraft used to ferry rescue equipment to the danger zone; youngest son Alan (often aided by Scott) piloted the organisation's spacecraft, Thunderbird 3 whilst Gordon was in charge of the smallest Thunderbird, number 4, which was a submarine. The remaining son, John, shared tours of duty with Alan aboard Thunderbird 5 which was permanently in earth orbit as a radio listening post. Thunderbird 2 was probably the most interesting design with its centre section, one of six possible Pods, being selected to suit each rescue by virtue of the variety of specialised ancillary equipment inside.

Also on the island were Jeff's mother and a

The Tracy family's loneliest post – Thunderbird 5, manned alternately by Alan and John, intercepted distress signals.

young Eurasian girl, Tin-Tin, who was Alan's love interest and the daughter of the family manservant, Kyrano. Kyrano had the misfortune to be the half-brother of a rather unpleasant character known only as The Hood. As the organisation operated in secret, The Hood used every devious means (including a strange psychic hold over Kyrano) to try and photograph the craft, though quite how a set of exterior shots of the Thunderbirds would enable him to go away and *build* one escapes me!

'Yes M'Lady . . .'

Probably as memorable as any characters on Tracy Island were International Rescue's British agent, Lady Penelope, and her chauffeur, Parker. Based in a magnificent English country stately home the daring Lady and her comical side-kick engaged in adventures aboard their revolutionary 21st Century Rolls Royce motor car, licence plate 'FAB 1'. Parker, in particular, was the source of much of the series' humour and comic relief.

The series premiered on British television in Autumn 1965 and was an immediate success. Lew Grade tried to sell it to one of the American networks and nearly managed it; on arriving back in London he was met with a 'phone call saying that the deal was off. Nevertheless, the programme did make an impact in syndication and it became the biggest Anderson success to date. So much so that the next logical step was undertaken – a feature film. Produced in 1966, *Thunderbirds Are Go* was the first opportunity the British had to see any Anderson production in colour. Budgeted at around £250,000, the film's main plot concerning Man's first trip to Mars seemed grandiose enough. International Rescue abandoned its role as saviours to provide elaborate security for the second launch of the Zero-X mission, only to assume it again when the craft encountered difficulties upon its return to Earth.

The film was distributed by United Artists with their Head of European Production pondering whether the film (and its sequels) would be just as big, or even bigger, than their own James Bond pictures! It was a shock to everyone that, despite an elaborate London premiere and heavy advertising, the film bombed-out in the rest of the country. Despite this, and due to the buoyancy of the British film industry at the time, a second feature was produced in 1968 entitled *Thunderbird 6*. This smacked more of an elaborate expanded television segment and the 'teaser' of wanting to know just what the sixth Thunderbird would be like wasn't enough, especially when it turned out to be a vintage Tiger Moth aeroplane. The built-in irony of simple design triumphing over sophisticated technology somehow got lost along the way.

Seven years' bad luck for Lady Penelope, International Rescue's aristocratic British Agent.

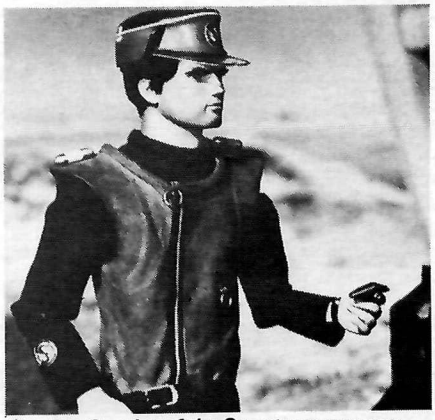
In the laboratory on the Tracy family's secret island base, Scott and Virgil Tracy consult the stuttering family scientist, Brains.

Between the features, Anderson made a further six television episodes of *Thunderbirds* and also embarked upon his next project. The extra episodes (making a final total of 32) were probably done to assist American marketing as there are certain optimum numbers of episodes they can use. These six episodes are also subtly different from the rest as they employed the puppets specially made for the first feature (and are slightly refined) and, for example, Virgil Tracy's voice artiste was different.

Mega-Merchandising

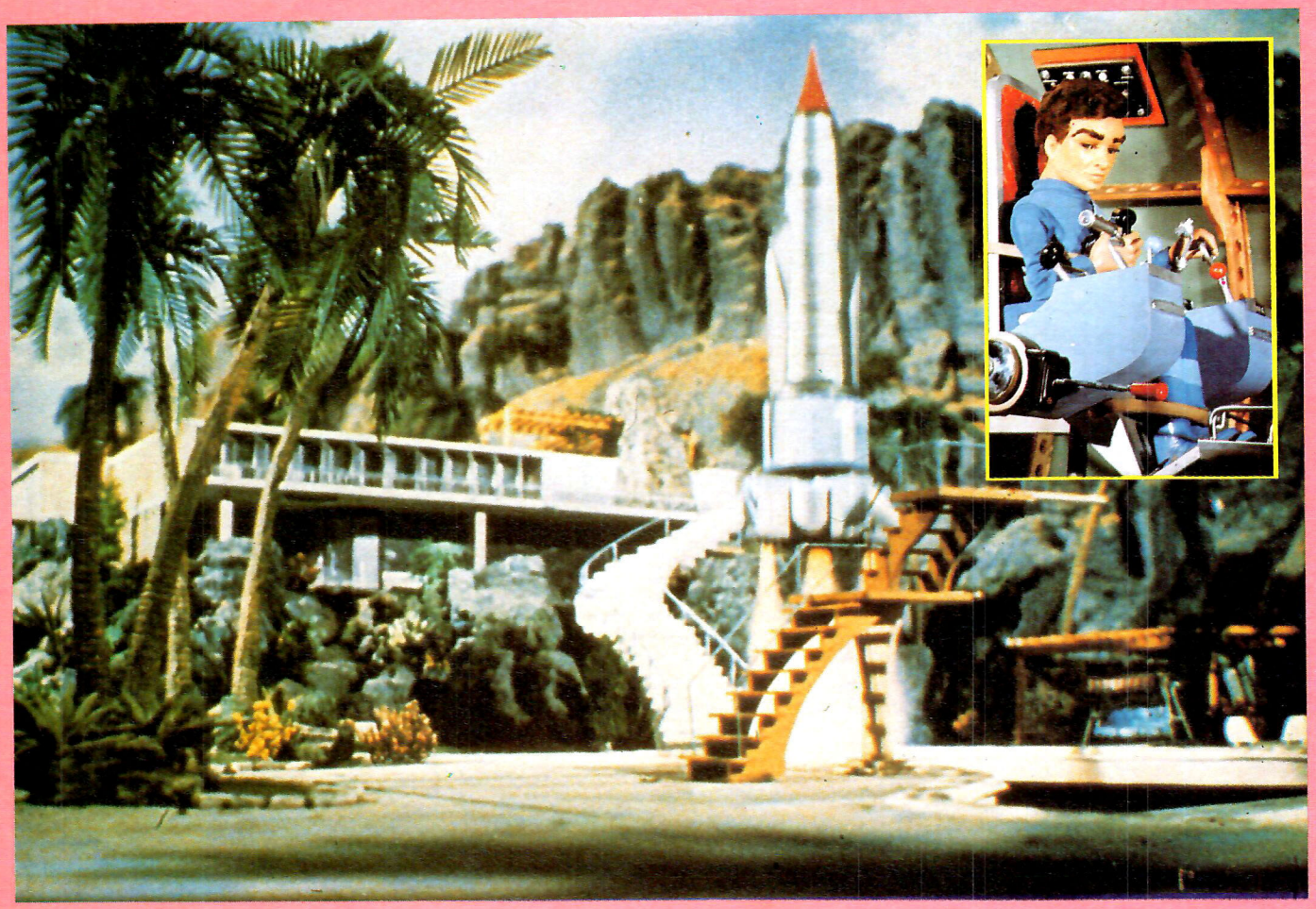
It was also about this time that A P Films was dissolved and replaced by Century 21 Productions. The whole operation had expanded immensely, particularly in the field of merchandising. Until *Star Wars* came along *Thunderbirds* enjoyed probably the greatest merchandising effort of any film or television production. It will probably be impossible to completely list the merchandise covering books, toys, construction kits, records, clothes, home movies ad infinitum. One item, though, is worth mentioning – the weekly comic *TV21*. This first appeared in February, 1965 (though cover-dated 100 years into the future!) and featured *Supercar, Fireball XL5* and *Stingray.* It became the largest selling British comic with its superb reproduction (especially colour photographs on the front, newspaper-style covers) on good quality paper. The standard of artwork and scripting was generally high, especially when Issue 52 saw Frank Bellamy penning the first *Thunderbirds* stories. What the publication also did (especially in the yearly Annuals) was to try and link Anderson's various series into a defined future universe. As Anderson had never conceived his productions with this in mind the comic often tripped itself up by contradicting events and dates seen on-screen. It was a nice idea, though, and one which found much favour with readers.

Only once has Gerry Anderson shown a link between formats when, at the start of *Captain Scarlet And The Mysterons,* the planet Mars was shown being explored by the Martian Excursion Vehicle from, obviously, a successor to the Zero-X shown in *Thunderbirds Are Go.*

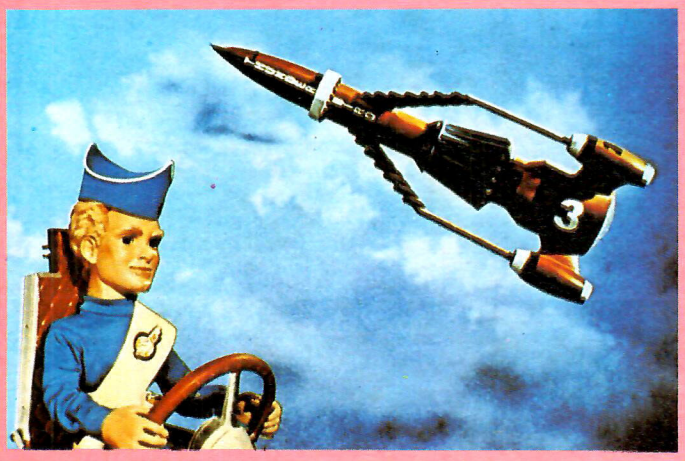


Captain Scarlet of the Spectrum agency.

Overleaf, left, clockwise from top: Thunderbird 1 with, inset, Scott Tracy; Lady Penelope's pink Rolls, FAB 1; Thunderbird 4; Thunderbird 3, flown by Alan; Brains, Virgil and Gordon Tracy in Thunderbird 2. Right, clockwise from top: the Spectrum Pursuit Vehicle and Captain Scarlet, Spectrum agent; Joe (90) McClaine's family car gives a new dimension to driving; Joe and Professor McClaine; agent Joe 90 receives a new brain pattern.



FAB 1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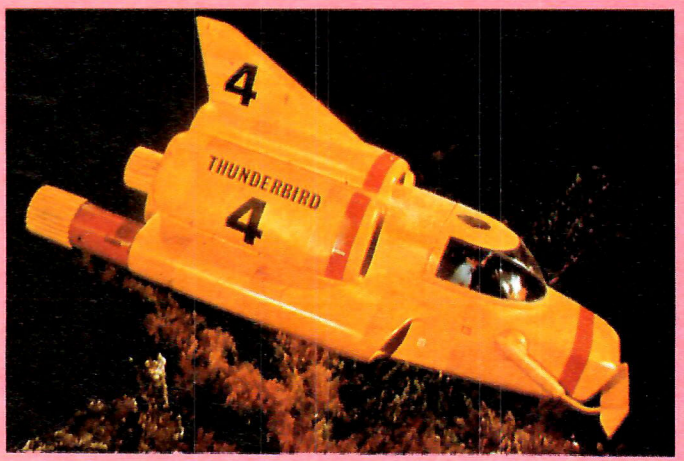
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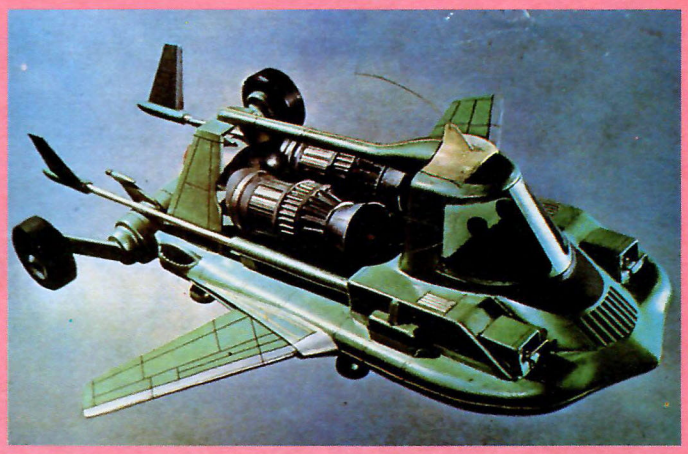
THUNDERBIRD
4

SPY



Commanded by Captain Black of the Spectrum organisation, the explorers disturbed the city of The Mysterons, a long-since-departed alien race whose discarded computers took revenge on the trigger-happy Earthmen by waging a relentless war against planet Earth.

Spectrum met this challenge from their Cloudbase headquarters, so named because it hovered some 40,000 feet up in the atmosphere like some giant aircraft carrier in the sky. Their rank structure was cleverly based on colours of the rainbow with Colonel White at the head. Other ranks included Lieutenant Green, Doctor Fawn and, of course, the Captains with Scarlet and Blue being the main men. They were not as secretive as International Rescue and seemed to operate quite freely in the world of 2067.

The Mysterons did not have operatives as such but, as the opening credits for the programme explained, 'possessed the ability to recreate an exact likeness of an object or person. But first they must destroy!' Captain Scarlet himself suffered such a fate when he was killed in a car crash. His Mysteronised alter ego subsequently plunged hundreds of feet from a skyscraper car park only to live again – but without the Mysteron influence. Captain Scarlet became Spectrum's secret weapon in that he could not be killed in action and remained virtually indestructible. Just as the American *Batman* series, being screened about the same time, had to have a prologue grafted onto each episode warning children not to copy the Caped Crusader's antics, so *Captain Scarlet* viewers were similarly warned that *they* weren't indestructible and shouldn't pretend that they were!

The build-up to *Captain Scarlet* was impressive. Just as *TV21* had featured adventures of Lady Penelope before *Thunderbirds* appeared, so The Mysterons appeared in a short-lived comic called *Solo.* Another facet of Spectrum was revealed in *Diana* (a weekly comic for girls) which told the stories of a team of pilots. The novelty was that they were all girls and it all fell into place when the team, known as 'The Angels', moved on to become the pilots of Spectrum's elite squadron of Angel aircraft operating out of Cloudbase.

Puppet scales

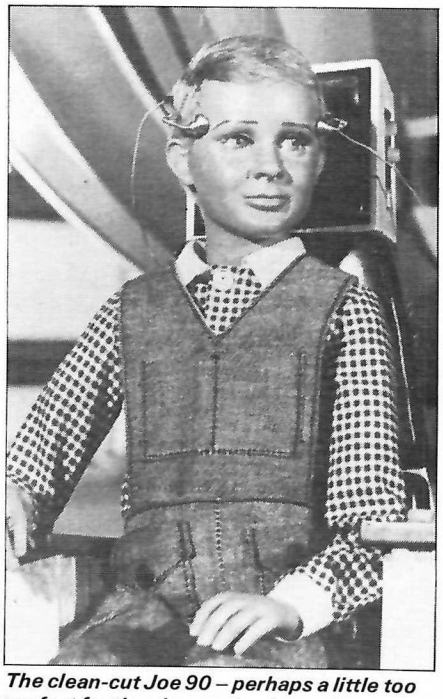
The series returned to the half-hour format even though Anderson himself would have been happy to have continued with *Thunderbirds.* There were sound commercial reasons for moving on as once everyone had bought all the *Thunderbirds* paraphanelia you weren't going to sell anymore, whereas a whole new set of machines and characters in a brand new series would open up the same market all over again. Indeed, the Dinky Toys version of the Spectrum Pursuit Vehicle (SPV) remains the biggest selling die-cast toy of all time. *Captain Scarlet* also saw a far more significant change over what had gone before. The puppet's mouth mechanism which had hitherto been housed in the characters' heads was now moved into the body. This meant that a perfectly proportioned puppet could now be manufactured. In his efforts to produce the definitive puppet character, Gerry Anderson's team could now create puppets which were, to all intents and purposes, miniature human figures with beautiful sculptured faces of lifelike appearance.

Anderson is on record as saying this was his biggest mistake. With a puppet which looks exactly like what it is, a puppet, you can get away with a lot. A slight wobble of the head, the occasional twitch of an arm, can be got away with on-screen because you're not trying to deceive the audience. With the *Captain Scarlet* (and subsequent) puppets such anomalies proved unacceptable though the price for their elimination led to static characters, often operated from below as opposed to by strings from above. That special quality of an out-and-out puppet presentation seemed to be being eroded away.

Not that *Captain Scarlet* was anything but a success; it certainly was, though not on the same scale as *Thunderbirds.* Merchandising was intense and the series probably ranks as a good second to its predecessor. Anderson also points out that the hour-long format of *Thunderbirds* allowed so much more scope and it has always been erroneous to compare his other productions with it.

Smart kid!

By the time *Captain Scarlet* came to an end Anderson's own position appeared to be taking more of an administrative nature. By the time *Joe 90* appeared he was credited only as being jointly responsible for the series' format. Reg Hill was Executive Producer with David Lane producing. The idea behind *Joe 90* was one which had been coldly calculated to appeal to young people. Joe McClaine was an ordinary 9 year-old boy with an adopted father whose skill with computers was second to none. Professor McClaine developed a device which was capable of both recording any person's brain patterns and then, even more importantly, being able to pass them on to a recipient. Joe could, therefore, receive the skills and knowledge of a whole host of specialists – aquanauts, astronauts, test pilots ... you name it! The *90* came in when the World Intelligence Network (whose top operative, Sam Loover, just happened to be a good friend of the Professor) got to know and adopted Joe as their Agent 90.



The clean-cut Joe 90 – perhaps a little too perfect for the viewers to stomach.

With *Joe 90* a main element in Gerry Anderson's production declined markedly. The heavy emphasis on hardware and visually-stunning machinery and vehicles was rejected in favour of more intense characterisations and plot devices. That's not to say hardware didn't play some role. There was always the McClaine family car; somewhat unusual in terms of design and the fact that it could also fly! There was also a nice assortment of helicopters, jets, tracked vehicles and suchlike but we were never again to feel the shudder of excitement as a Thunderbird loomed into view or a Spectrum Pursuit Vehicle crashed through a fence.

The Century 21 view was that all small boys would want to be Joe 90 and share in his adventures. His special school-case with concealed gun and special spectacles (that enabled him to draw on the implanted brain patterns) were all faithfully reproduced in the toy shops. He even (like Lady Penelope before him) found himself the star in his own weekly comic but ultimately little Joe failed to catch on in the big way expected of him. Why? Well, there is an argument that you can't patronise youngsters. Maybe Joe 90 was deemed to be too much of a smarty-pants and not fallible enough ... just like an older brother or even parent – who could relate to that? After 30 half-hour episodes *Joe 90* became 10 years old and lost on the scrapheap of adolescence.

Live action puppetry

The final Century 21 puppet series lasted just 13 episodes and has not even been seen in all the ITV regions. Called *The Secret Service* to many it showed that the writing was on the wall and Gerry Anderson had finally had enough of his stringed stars. The format revolved around a country vicar, Father Stanley Unwin, and his covert activities for (yet another) secret organisation, BISHOP. The only science fiction element concerned a device which could shrink people in size, notably Unwin's gardener Matthew who regularly became miniaturised and carried around in Unwin's suitcase! The hardware was reduced to a minimum (though Derek Meddings' skill with miniatures of conventional vehicles and aircraft was a highlight) with Father Unwin using a 1912 Model-T Ford as his personal transportation.

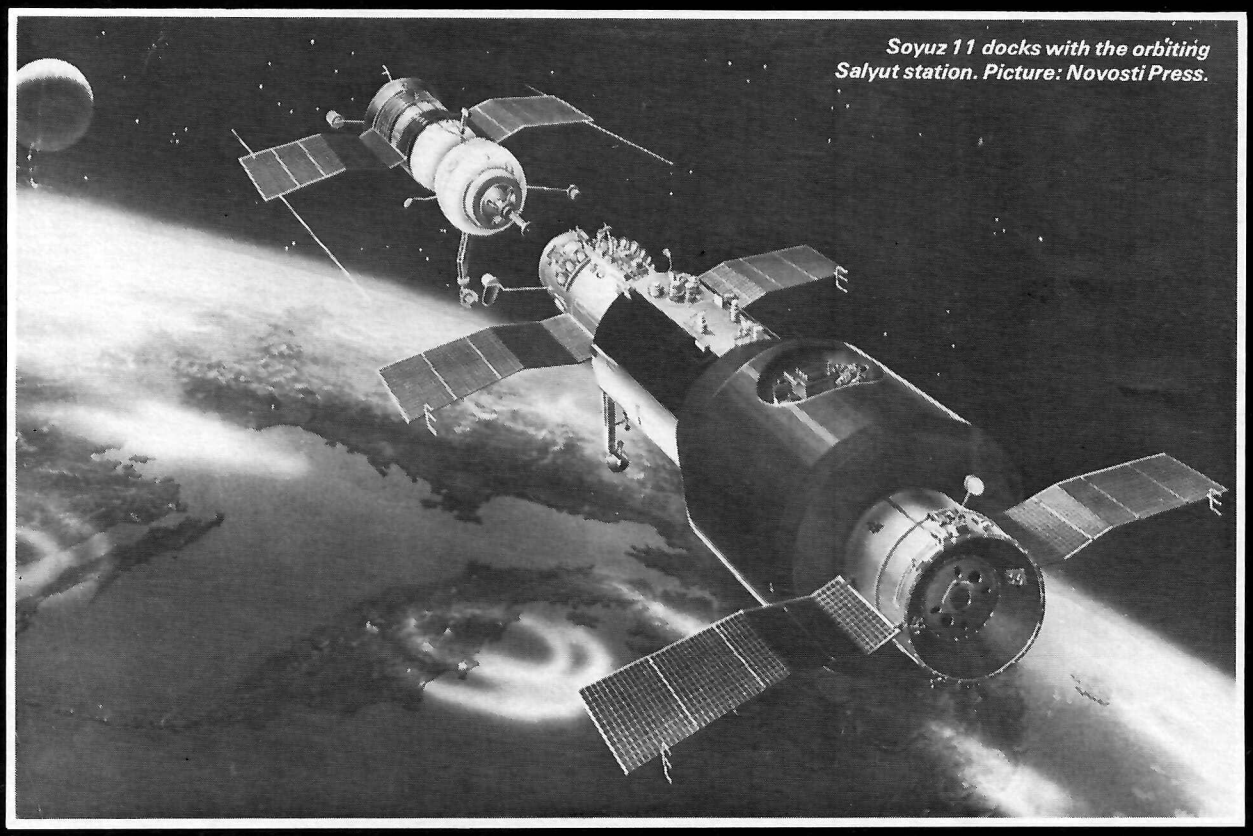
As you may well have by now gathered, Father Unwin was modelled, quite literally, after English character actor Stanley Unwin. Actor Unwin provided his puppet double's voice and was also seen in long-shots walking, say, from the Model-T to the front door of a house. Much like the church bell seen swinging ominously on the closing credits, this series sounded the death knell for this marvellous series of puppet productions. Stanley Unwin's gobbledy-gook 'Unwin-ese' language was tried as a means of getting Father Unwin out of various scrapes and as comic relief but it only served to make it harder to sell the series in America. Lew Grade was equally unimpressed and pulled the rug out from under the show.

It might have been the end of a long association between Anderson and Grade. Thankfully it was not to be. For Gerry Anderson another secret organisation beckoned, this time peopled by real actors dedicated to repulse the alien threat posed in *UFO...*

SOYUZ T-10

record breaking Soviet mission

FOR 237 DAYS THE RUSSIAN SOYUZ-SALYUT COMBINATION STAYED IN MANNED ORBIT ABOVE THE EARTH. IAN GRAHAM REVIEWS THE MISSION AND ITS IMPLICATIONS.



Soyuz 11 docks with the orbiting Salyut station. Picture: Novosti Press.

On February 10 1983, the world learned that a Soyuz spacecraft had been launched. Soyuz T-10's crew were to stay in space for longer than any other human beings. Commander Leonid Kizim, engineer Vladimir Solovyov and researcher Dr Oleg Atkov were to remain in their Salyut-7 space station in low Earth orbit for a record-breaking 237 days and receive visits from two other Soyuz crews.

Press reports from the Soviet Union told the story of a busy programme of experiments in astrophysics, astronomy, psychology, physiology, medicine, biology, genetics, Earth resources, meteorology, industrial processes and spectrometry – a total of over 500 experiments! The flight was divided into sections of a week or so and each section was devoted to one type of research. But perhaps the most impressive feature of the flight was a series of six space walks lasting about 24 hours, during which Kizim and Solovyov carried out 'servicing' work on one of the station's engine modules. They opened up the engine cover, replaced a fuel valve and a section of 'conduit', checked them for leaks and re-assembled the engine insulation and cover. A couple of weeks later the procedure was repeated and a second section of conduit was installed.

Service or repair?

American analysts placed a very different interpretation on these events. According to their reports, the Salyut space station suffered a near catastrophe in September 1983 when fuel lines ruptured during a routine refuelling operation. Fortunately for the crew then in occupation, the fuel did not explode as it might easily have done, but vented to space. The station is said to have limped along until the February '84 mission began, a mission specifically formulated with the aim of repairing the crippled facility. Soviet reluctance to admit failure of any sort precluded the description 'repair' – hence its description as a 'servicing' mission.

The six space walks required to carry out the repairs were interwoven into a full scientific and technological research programme. They were normally carried out when Salyut's snaking orbital path across the Earth's surface brought it directly over Soviet territory, offering the best possible radio communications. But what course is the Soviet Union's space

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research taking that requires a crew to stay in space for eight months?

The obvious answer, which many space commentators have suggested, is that Russia is committed to establishing a permanently manned orbiting space station. Soviet space officials have said as much themselves. But opinion in the West is split. Others are equally certain that the Soviet Union is going for a manned Mars landing by the end of the century. Both camps cite US Air Force reconnaissance photos of Apollo-class and Space Shuttle type boosters in preparation and reports of flight tests of unmanned Shuttle mock-ups as evidence for their respective cases. Of course, both many be correct. An orbiting station could be used as a staging post, a fuelling and provisioning station or even a spacecraft construction centre on the way from Earth to Mars.

Weight problems

In January 1983, General Vladimir Shatalov, in charge of Cosmonaut training, said that Soviet astronautics were mainly concerned with the problems of constructing and manning permanent orbital stations. On February 15, a week after the record-breaking flight began, Cosmonaut Boris Yegorov again announced that the Soviet Union was aiming to establish 'long-lived orbital complexes with replaceable crews'. He stressed that one of the main problems with long duration flights was the way the human body reacts to weightlessness and this would be a major area of study during the current flight.

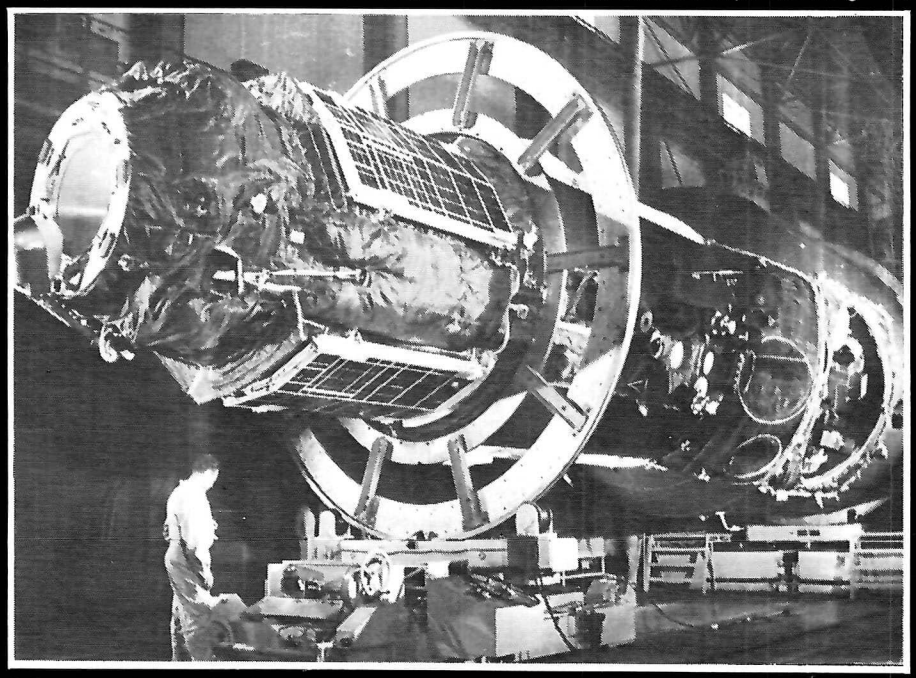
One of the crew, Oleg Atkov, was a physician, a heart specialist, whose task was to carry out extensive on-the-spot medical and general health experiments on the crew throughout the flight. He continually monitored the state of the crew's cardiovascular system. It is well known that crews of long duration spaceflights lose calcium from the bodies, so Atkov carried out experiments designed to study the effects of calcium regulating drugs on crew members and also tried out a variety of training regimes.

On February 9, Soyuz T-10 docked with Salyut-7, which had already been in orbit for two and a half years, of which 595 days were manned. On April 3, the first visiting crew took off from the Baikonur Cosmodrome. The international crew included the first Indian Cosmonaut, Rakesh Sharma. The launch was shown live on Indian television and caused great excitement in the cosmonaut's home town, Hyderabad. The visitors' Soyuz T-11 remained docked with the Salyut-7/Soyuz T-10 complex for a week, during which experiments involving observations of Indian territory and yet more medical tests were carried out. Sharma even managed to fit in some Yoga, not just impromptu relaxation, but as a positive contribution to the medical study programme. The visiting crew returned to Earth in Soyuz T-10, leaving their Soyuz T-11 docked with Salyut-7.

First woman in space

The second visiting crew, which included Russia's second woman cosmonaut, Svetlana Savitskaya, docked their Soyuz T-12 with Salyut on July 19. Savitskaya became the first woman to make a space walk, when she and Commander Dzhanibekov carried out some fairly heavy welding and cutting work in open space – procedures essential for the construction and maintenance of orbital structures. During the three and a half hour space walk, Savitskaya operated a tool weighing (on Earth) over 30 kilograms and resembling a large camera with several lenses. The instrument, developed under the direction of Soviet scientist Academician Boris Paton at the Ukrainian Academy of Sciences, enabled Savitskaya to cut or weld metal components using a powerful electron beam. Experiments in soldering in open space were also carried out. Savitskaya used another tool to experiment with spraying a thin coating of silver onto aluminium. An electron beam fired at a crucible melted the metal inside (silver in this case) and the vapour was then condensed onto another metal surface. Thin polymer coatings (plastics) can also be laid down in this way. Volk, Dzhanibekov and Savitskaya returned to Earth in their Soyuz T-12 on July 29.

Throughout the eight month flight, the Salyut station was provisioned by a fleet of unmanned ferry craft, generally known as Progress vehicles. Five of them visited Salyut during the mission, bringing fuel, food, water, new equipment and mail from Earth. Each Progress craft, which looks like an unmanned Soyuz spacecraft, can deliver more than two tons of supplies. Docking and connection of is fuel supply lines to Salyut are automatic. After docking, Progress's engines can also be used to modify Salyut's orbit.



Salyut in the assembly shop. Photo: Novosti Press Agency.

Record breakers

On September 7, Kizim, Solovyov and Atkov exceeded the previous space endurance record of 211 days, set by Anatoli Berezovoy and Valentin Lebedev in 1982. It didn't immediately become a record, however. The International Aviation Federation will only recognise a mission as a record breaker if it exceeds the duration of the current record-holder by at least five percent. The mission ended on October 2, when the descent module of the Soyuz T-11 spacecraft landed 160 kilometres east of the city of Dzhezgazgan. In a Press conference three weeks later, Atkov identified weightlessness and its effects on the body as the biggest problem in long duration space flights, but cited his own excellent state of health so soon after the mission as evidence of progress towards a solution. Academician Oleg Gazenko added, 'Theoretically, we see no basic constraints for the further build-up of flight duration, but it is undoubted that longer flights spell greater difficulties of a re-adaptation character.'

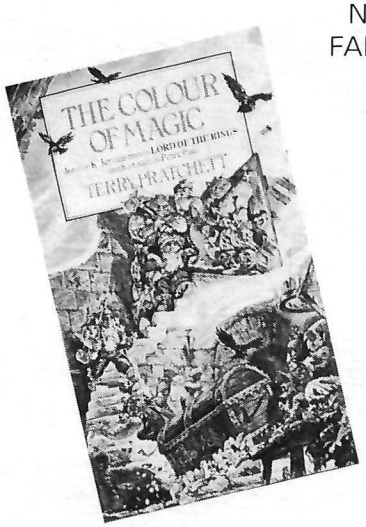
In an interesting contribution to the conference, Academician Alexandrov said, 'It is often asked if people already can fly to Mars and how soon settlements will appear on other planets. Technologically, we have certainly gone a long way toward this goal. But it must be remembered that a round trip to Mars will take three or four times as much time as did the present expedition. Salyut-7 is regularly supplied with everything necessary from Earth, but in a flight to Mars no such possibility will exist. There are many other problems and the most important thing – we must clearly understand for what practical needs such settlements on other planets are necessary. So far, apart from purely scientific tasks, no such necessity can be discerned. Automatic vehicles, as we know, successfully accomplish scientific investigations. Therefore, it is premature to talk about settlements on other planets,'

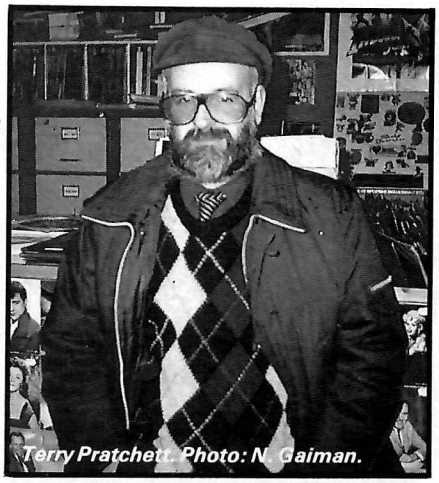
Coming soon

From these and other pronouncements, it seems clear that the Soviet Union, like the United States, is moving towards establishing a permanently manned orbital station in the near future. In the longer term (the 21st century – not far off, now), the natural follow-on from the experience gained in the construction, crewing and maintenance of long-lived space structures is ultimately to go to the planets.

The colour of Pratchett

NEIL GAIMAN TALKS TO THE AUTHOR OF FANTASY'S MOST COLOURFUL NEW BOOK.




Terry Pratchett. Photo: N. Gaiman.

Terry Pratchett is the author of a book that ought to appeal to most *Space Voyager* readers. It's called *The Colour of Magic,* and it's an attempt to do for the fantasy field what *Hitchhiker* did to science fiction – send up all the conventions, and generally have a fun time doing so.

He's written three other books in the SF field. (His last novel, *Strata,* was described by one reviewer as 'relentlessly inventive, which in the space of a fairly short novel manages enough ideas to keep most SF writers happy for a trilogy of trilogies.' All right, I admit it: I was that reviewer.) His first SF story, however, was published when he was the unbelievably young age of thirteen.

'It was a terrible thing to happen to someone,' he told me. 'The very first thing I ever wrote got accepted, which is quite the reverse of the normal procedure. So then I spent five or six years learning to write – as if by sheer chance the first dart I'd ever thrown had hit the bullseye. My next books were *The Carpet People, The Dark Side of the Sun, Strata* and *The Colour of Magic. Strata* was good – I had fun writing that.'.

Like *The Colour of Magic, Strata* mostly takes place on a flat Earth, which is treated as a kind of parody of Larry Niven's *Ringworld.* 'Well, Larry Niven is a very easy writer to copy, all his characters speak in exactly the same way. No-one ever stops to think about things they just go out and do them. *Ringworld* was *really* good (taken apart it doesn't stand up at all, but it's jolly good fun). I liked the way everything in *Ringworld* worked like clockwork, so I said "Right! No-one's put together a universe that doesn't work at all, where the whole thing ticks over solely due to a remarkable input of power." That was *Strata.'*

The Colour of Magic is the story of a fairly useless wizard who finds himself acting as a rather unwilling minder to a tourist and a somewhat supernatural paradimensional walking traveller's chest. In it Pratchett borrows from and pokes fun at authors as diverse as Fritz Leiber, Ursula K Le Guin, H P Lovecraft, Robert E Howard and Anne McCaffrey – to name but a few.

Having said that, I was totally at a loss when confronted by the cover blurb, which reads 'Jerome K Jerome meets *Lord of the Rings* (with a touch of *Peter Pan*)'. Could he explain it?

He shrugged. 'Don't ask me to explain what publishers say!'

Hitchhiker Similiarities

Aren't the wizard and the tourist a little reminiscent of Arthur Dent and Ford Prefect? 'You can go a long way by having two characters, one of whom is streetwise and the other who is innocent and a lightning conductor for trouble. And you stick them together – which is what Douglas Adams and many other people have done, it's what I did – and you get a sort of sword and sorcery Laurel and Hardy.

'Twoflower (the tourist) really believes that because he's not really involved because he's a tourist, even though he could be in the middle of a battle the thought that something could actually hurt him doesn't enter his scheme of things.'

There are points in the book when it almost reads like Douglas Adams. 'Well, I write like the last author I read. I've really had to stop myself writing like Larry Niven; for someone who's a bit of a comedian, as I am, he's such an obvious person to copy. Now, I've got to admit that while I hate and despise Trekkies (A *Dr Who* fan can walk under a snake, while a Trekkie can walk under a snake wearing a bowler hat!) *Hitchhiker's Guide* fans are a great bunch of guys.

'The only trouble is that sometimes people take it seriously, and then you begin to panic. I was so impressed by *Hitchhiker* that I've got the world's only talking door. Very easy, microchip, processor, got a bloke to write me some software and as you go through it, it says "Glad to be of service" "Please enjoy your trip through this door." It's a lot of fun. But I get uneasy when people take these things too seriously.'

Is he worried that people could take *The Colour of Magic* too seriously?

'I don't imagine that any one *could* take it seriously. I don't take things seriously. If World War Three actually happens, I want to be the one to say, as the mushroom cloud erupts, 'Well, that about wraps it up for this lifetime!' If you've got to say something that's a great deal better than saying 'Aaaaarrggghh!'

'But you know, a lot of the fun is in taking something dead seriously, and thus exposing the funny side of things – like The Law of Conservation of Reality, which says that you can make a wineglass move – or *appear* to move – as long as all you're doing is moving photons, but you've got to be very careful if you're really lifting the wineglass by magic in case the Law of Conservation of Reality cuts in, and your brain is forced out of your ears. That's a dead steal from *The Wizard of Earthsea.*

What really matters

'But *The Colour of Magic* is the stand-up comic of fantasy – there's *never* been one in fantasy before, it's so humourless. *Conan* is so humourless – I loved the film, but the book – what a load of *trash*! In the book I'm doing now (the sequel to *The Colour of Magic*) there's a direct steal from the film. Do you remember that scene where they're all sitting round a campfire going 'what is the best thing in life?' 'The wind in your hair and the lamentation of the womenfolk!' I nodded. 'Well in my book there's Cohen the Barbarian, who's eighty-seven, and when his turn comes around he says 'Good dentistry and soft toilet paper'. A lifetime of sleeping rough has taught him that what really matters are hot-water bottles, dentistry and soft toilet paper.

'I suppose that by and large I think the books are a homage to the people who have given me so much enjoyment – I just go for the soft underbelly.'

Besides writing fantasy and science fiction, acting as dungeon-master for his local *Dungeons and Dragons* group, and casting bees and locusts in precious metals (all of which he does) Terry is currently employed as a PR for the electricity board, and has been a journalist for many years.

He still feels himself more a journalist than a writer. 'A journalist,' he explained, 'has a rapist's mentality. Get in there, get what you want, get out again quick. An interview needn't last more than fifteen minutes. A good quote for the middle, a good quote for the end, and the rest of it you make up back at the office.'

(Editor's note: Not all of us!)

Photographing MODELS

HAVING BUILT A MODEL, A PHOTOGRAPHIC RECORD WILL HELP TO KEEP IT FOR POSTERITY. BARRY JEEVES SHOWS HOW TO MAKE THE MOST OF YOUR SUBJECT.

The Author's photo of a Space 1999 Hawk fighter and starscape.

Model-making can be fun, but alas, the end product is usually a frail creation endangered by dust, dusters and the prying fingers of the doubting Thomases who never believe it is real until they have managed to break off a piece. One way of minimising such hazards is to compile a photographic record of each model you make.

So how does one go about the job? Obviously, the first essential is a camera. The handy little Instamatic types are not much use here, their lenses are not designed for close-up work; their lack of shutter and diaphragm adjustment is a big drawback and the parallax error introduced by the viewfinder being offset from the lens is a nuisance.

What's really needed is a single-lens reflex camera with various shutter speeds and f stops to allow adjustment for different lighting conditions. I use a Fujica STX-1 with a supplementary close-up lens, but virtually any half decent reflex camera will serve.

It is tempting to start by putting the model outside, on the lawn or strip of carpet, on a bright sunny day. The resulting photograph will show you just that. . .a model plonked down in the garden. More often, you will not get a photograph as by the time model, carpet, camera and everything else has been set up, the sun will have gone, and the rain set in. The solution is to do all your model photography indoors using artificial lighting.

Lighting the model

To light a model properly, you need at least two lights. To get the best out of them, they should be in reflectors. If cash is scarce, you can get by with a couple of aluminium pie dishes with holes cut in them to fit the lamp holders. You can even use domestic 150W lamps. However these give less light, and it is of the wrong colour balance for pictures. Two Photoflood No. 1 lamps from any photographic shop will cost about £1 each and will give excellent results.

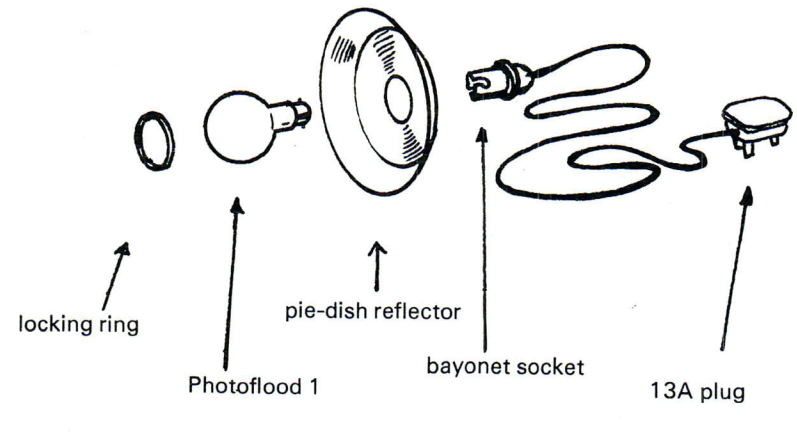
Sometimes I also use a spot lamp with built-in reflector as used in window-dressing. This is ideal for side lighting and washing out unwanted shadows. To use the lamps, I made up two lengths of lead (8 ft long) terminating in bayonet lamp sockets and reflectors at one end, and three-pin, 13 A sockets at the other. (See Fig. 1).

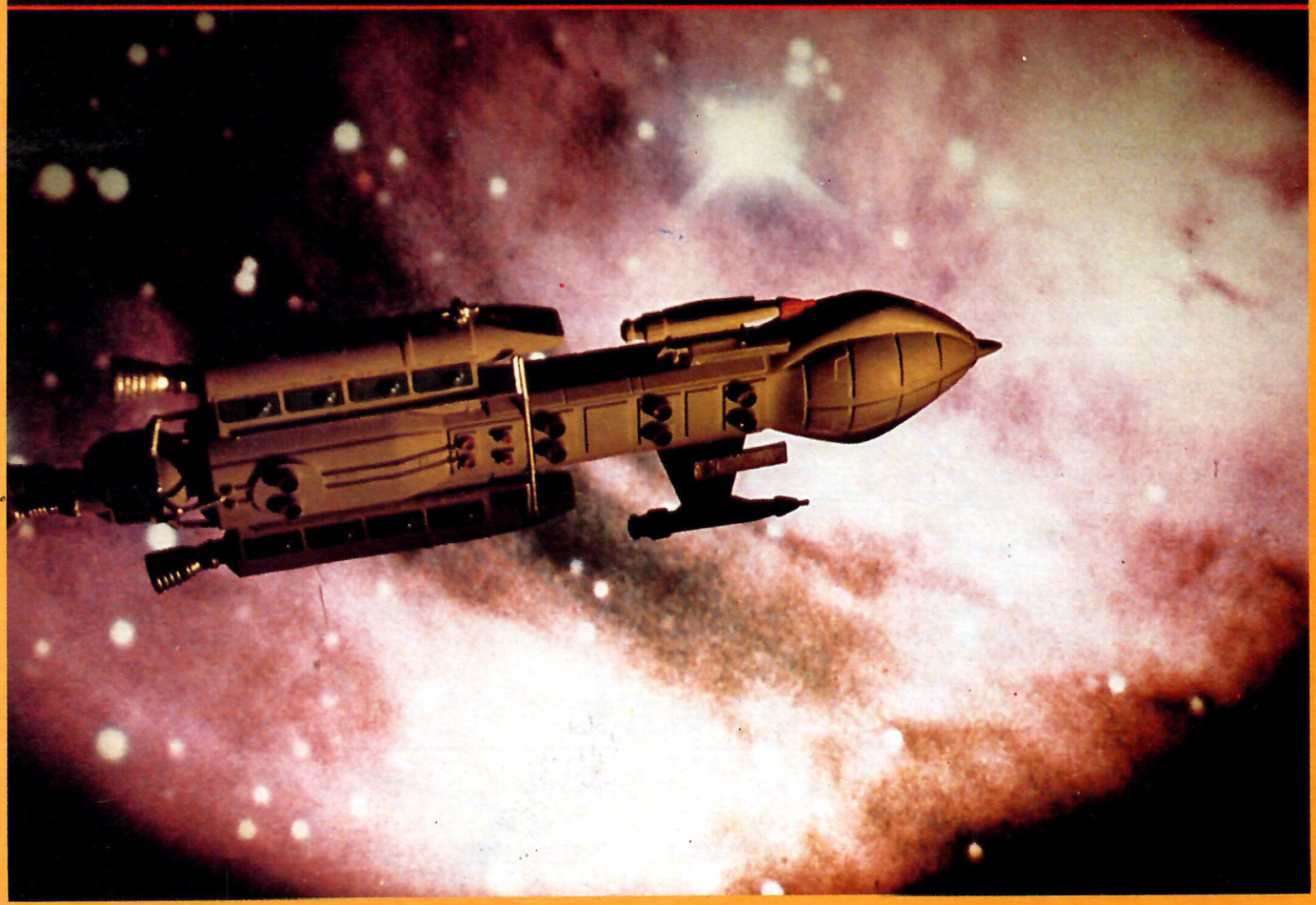
Since Photofloods cost so much and use a lot of electricity, it is best to treat them with care. Repeated on/off switching can damage the filament so minimise this thermal shock and avoid long running times. The old way used to be a series-parallel switch which ran the lamps in series while setting up and so reduced current usage. On switching to parallel, the lamps got full power and were ready to use. Some people still use this method, but I made myself a thyristor drill-speed controller and mounted it on a board along with two 13 A sockets and a main switch. Using this, I plug both lamps into the controller and can then fade them up from total extinction to full brilliance without that sudden switching on thermal shock which does all the damage.

Backgrounds

Having gone to all this trouble, don't just put your model on table or carpet, switch on the lights and shoot away. Make up a background. I got several large sheets of cardboard from an old washing machine delivery box, pasted

FIG. 1 Making up leads for the lamps





white lining paper on both sides (to prevent curvature as they dried) and with one-inch paint brush put in a sky wash of light blue, followed by hills touched in with green. On another sheet, I washed in a blue sky, dabbed this with tissue while still wet to raise light fluffy clouds and finally put a hole through the middle to take a wire support cradle for when I wanted a model to fly.

A look at figure 2 will show the set-up used. The background card is Sellotaped to a chair standing on the kitchen table. Along its bottom edge is laid a green length of cloth which not only hides the base line, but also doubles as a grassy field. A small hangar made of thin card is also placed at the junction to help force the perspective of the scene. Camera level is kept as low as possible to further hide that base line and also to mask the actual proximity of model to background. To keep the camera steady I used a simple G-clamp with a camera screw attached. The lights are fastened to anything handy, stools, chair, piles of books or if you have them, proper lighting stands. One light shines from high on the left, the other lower and to the right.

When all is ready, bring up the lights and adjust them to avoid any shadows on the background and to give the most pleasing effect. This is where the spot lamp comes in handy for 'washing out' unwanted shadows. Satisfied with the lighting, take an exposure reading and set shutter and aperture on the camera. Use the smallest f number you can manage. . .and balance it with a slow shutter speed. This will give the greatet depth of field . . . and prevent background, or even parts of the model, from being out of focus. To avoid any camera shake, always use a cable release when you take the shot.

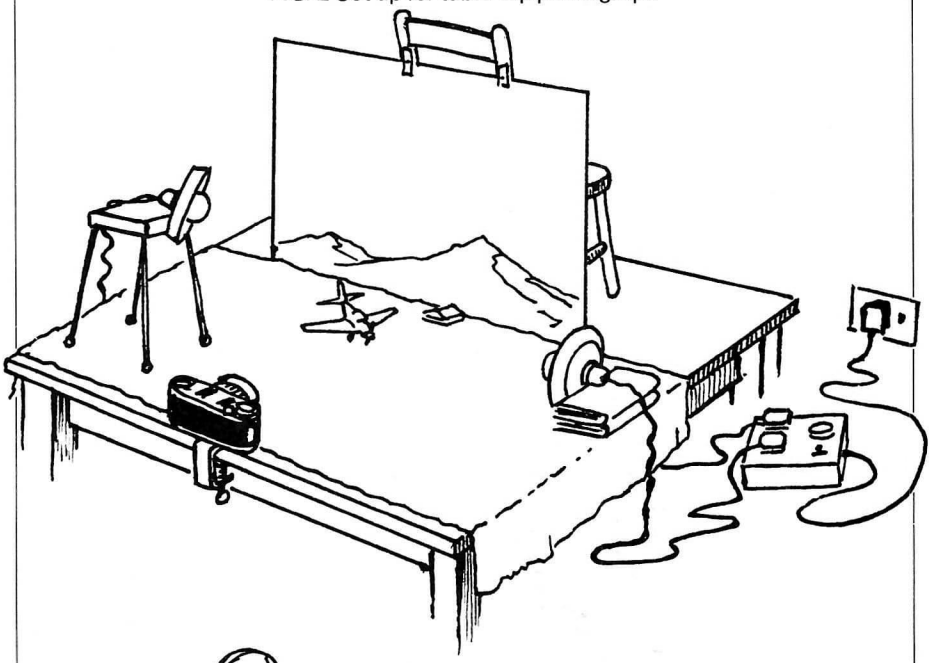
Flying cradles

Want a shot of your model in the air? Set up as before but use a background with a hole in the centre. Through this poke a length of wire (an opened-out coat hanger is ideal) with a cradle bent on the end to fit the model. Tie one end to the supporting chair, and adjust the model on the cradle so that it masks the supporting wire from camera view (Fig 3). Lighting is more tricky here so the lamps are best set in line on either side of the model, or with one shining slightly from above. Once again, fiddle them around until you have a composition that suits you and which avoids any model shadow falling on the sky! BUT. . .just before you press the shutter release, if your model has an airscrew, give it a flick. . .or better still, borrow the wife's hair drier and let its wind turn the prop for you. After all, you don't want to shoot an 'engine-out' landing do you?

Another problem-solving way to realism is to use back projection. I wanted to photograph some space models against a background of nebulae. . .shots of which I had on a set of colour transparencies bought from an advertiser in *Space Voyager*. I had a back projection screen but didn't want to make a hole in it. Wires and threads were out, as they would show up on the finished photograph. The solution to this problem was to lay the screen flat across two chairs. The slide projector was placed on the floor with its beam bent upwards through 90° by use of a front-silvered mirror (my shaving mirror actually). The model was then placed directly on the screen, tilted slightly with the aid of a spot of plasticine, and, since it was in silhouette, I side-lit it with my spot lamp. I took an exposure reading from the screen. . .and since I knew this would be too low with only a central light area, I upped the reading slightly when setting the camera. The results were highly satisfactory, so if you want to try it, the whole set up is shown in Fig 4.

Although I concentrate mainly on air and space models, these principles apply equally well to any type of model. The picture I composed for my Christmas cards a while back featured two toy spacemen raising a suitable festive flag (a used ball pen refill) on a towel planet surface against a painted sky! Experiment is the name of the game, so get cracking and add a new dimension to your modelling.

FIG. 2 Set up for table top photograph



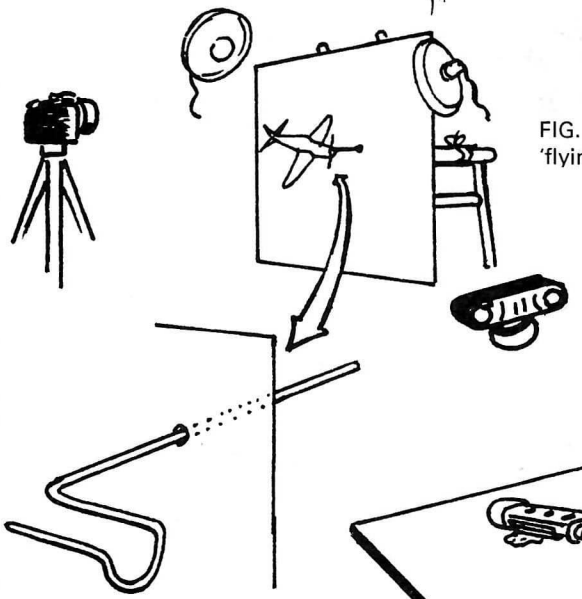


FIG. 3 Taking a 'flying' model

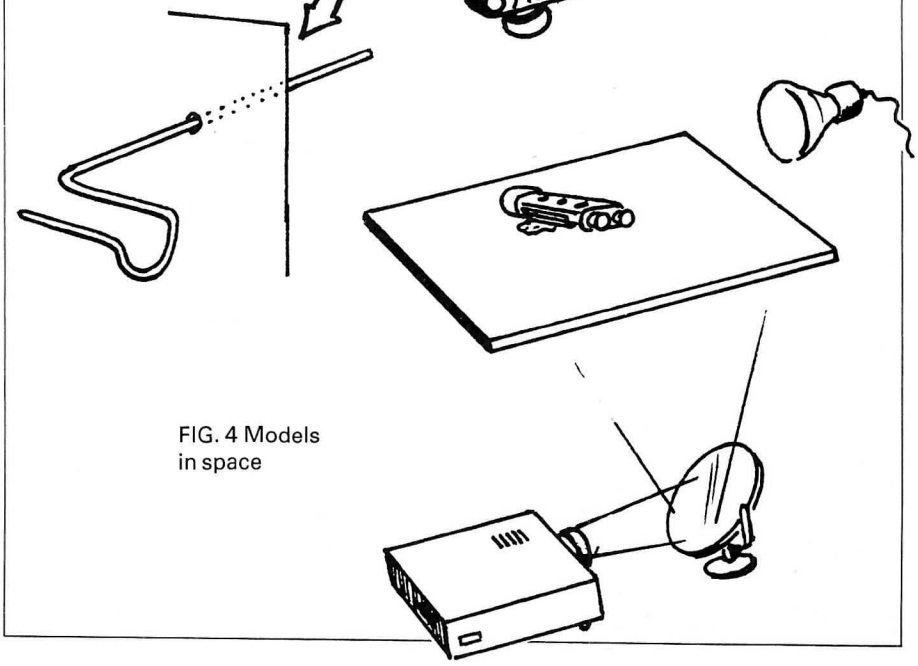


FIG. 4 Models in space

SHUTTLE *update*

Discovery on the launchpad. **Photo: NASA.**

AS NASA ENCOUNTERS MORE PROBLEMS WITH THE NOTORIOUS SHUTTLE TILES, GEOFF ENDACOTT REPORTS ON THIS AND OTHER SETBACKS AT THE CAPE.

The last few months have not been very happy ones for NASA. After the problems with Challenger's tiles, NASA thought they could get the spacecraft ready to be launched on February 20. They couldn't.

Then they planned to have it ready for March 3. It wasn't.

Finally, the launch was scheduled for March 7 and it looked as though Challenger would fly at last. It didn't.

Everything was ready and Challenger was on the launch pad, when mission controllers found a fault with one of the satellites it was carrying. Rather than launch a suspect satellite, the entire mission was cancelled.

Challenger should have carried the second NASA Tracking and Data Relay Satellite and the Canadian Anik C-1 communications satellite. It was a fault with the NASA satellite, usually referred to as TDRS, which led to the cancellation of the mission.

The TDRS network will eventually comprise three satellites to relay information from spacecraft in orbit to a ground station at White Sands in New Mexico. The first satellite was launched on Challenger's maiden flight in April 1983. Although it initially failed to reach geostationary orbit, a series of delicate manoeuvres finally nudged it into position over the Atlantic Ocean just East of Brazil. The second TDRS was destined for an orbit over the Pacific Ocean south of Hawaii. The first two satellites will complete the operational system, but a third will eventually be launched to remain in orbit as a spare.

Crews re-shuffled

Challenger was to have been commanded by Karol Bobko, who flew as Pilot on the orbiter's maiden flight. Donald Williams was to have been Challenger's Pilot this time and Mission Specialists were Rhea Seddon, Jeffrey Hoffman and David Griggs. Frenchman Patrick Baudry and US Senator Jake Garn were to have flown as Payload Specialists.

The selection of Jake Garn caused more than a little controversy. Many people were unhappy at the undue haste with which Senator Garn was added to the crew, as NASA only announced his selection on January 17.

Senator Garn is chairman of the Senate appropriations sub-committee which is in

charge of the NASA budget. NASA felt that the Shuttle programme would benefit if the man who controls the purse strings went into space himself. They also point out that Garn is an experienced jet fighter pilot. In fact, he has logged more flying time than many of NASA's own astronauts.

The cancellation of Challenger's latest mission has left the forthcoming launch schedule in a bigger mess than ever. The next mission should have taken Discovery into orbit on March 19. Discovery was due to deploy the third Syncom IV communications satellite and retrieve the Long Duration Exposure Facility. The latter satellite carries 57 experiments and was placed in orbit by Challenger in April 1984.

As a general rule, commercial customers are given priority over scientific missions. The Canadian Anik C-1 satellite was left grounded by the cancellation of Challenger's flight, so it has now been added to Discovery's payload.

The inclusion of Anik C-1 means there will not be enough room in Discovery's payload bay for the equipment needed to collect the Long Duration Exposure Facility. The NASA experimental satellite will therefore have to stay in orbit for a few more months.

NASA have also decided to replace Discovery's crew. Karol Bobko and the Challenger team have now been assigned to Discovery. That leaves six members of the original Discovery crew looking for a new assignment. Daniel Brandenstein, John Creighton, Shannon Lucid, John Fabian, Steven Nagel and Gregory Jarvis will have to wait to find out when they can fly.

The seventh member of Discovery's original crew, Payload Specialist Charles Walker, will keep his seat. He is needed to operate the McDonnell Douglas Continuous Flow Electrophoresis System. In order to make way for Walker, Frenchman Patrick Baudry is dropped. Baudry will now join Joe Engle's crew who are due to take Discovery aloft early in June.

All being well, Discovery should have flown late in March. That just leaves NASA to decide how to get the Long Duration Exposure Facility back and when to launch their second Tracking and Data Relay Satellite.

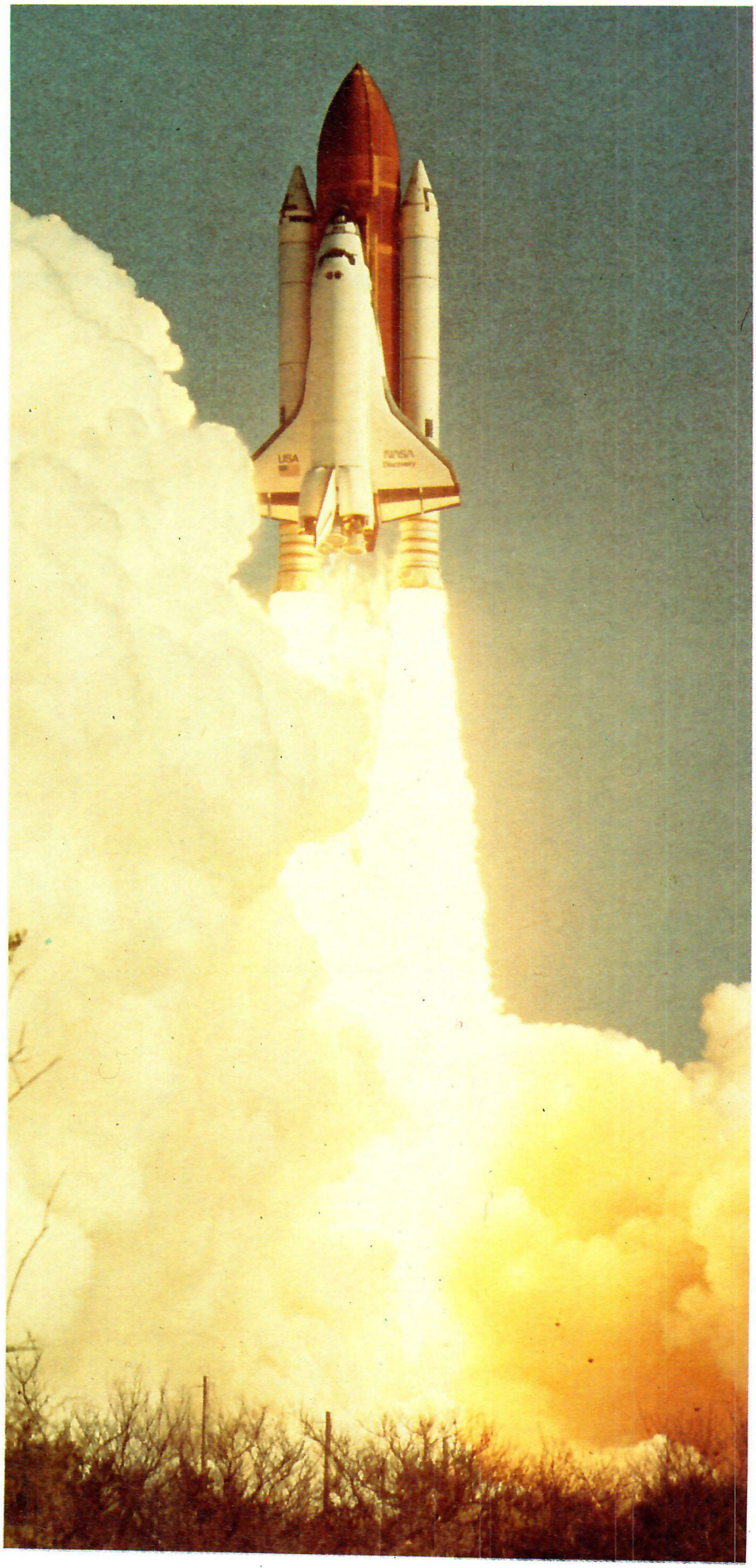
Tiles and other problems

Further details have now emerged concerning the nature of Challenger's tile problems. The trouble was caused by a waterproofing agent which reacted with a material called screed. Screed is a type of body putty used to smooth over certain areas of the orbiter before the tiles can be applied. The waterproofing agent used on Challenger was a chemical called sylazane. Unfortunately, the sylazane reacted with the screed causing it to soften.

A waterproofing agent must be applied to the Shuttle before launch to prevent water getting underneath the tiles. If this happens, the water turns to steam during launch, freezes in orbit and melts during re-entry. This can force the tiles loose. Water can also make the Shuttle much heavier.

Challenger was the first Shuttle to be treated with sylazane. Columbia was sprayed with a chemical called Scotchguard, but this did not prove very effective at keeping the water out. In fact Columbia absorbed so much water during a thunderstorm before its fourth launch that it had difficulty reaching orbit.

Sylazane has proved to be better at keeping



the water out, but it doesn't do the screed any good. NASA therefore conducted an experiment before Discovery's mission in January. 2,000 tiles were injected with sylazane and 2,000 were sprayed with Scotchguard. The results are still being assessed.

Hush-Hush Discovery

The January flight of Discovery was the first Shuttle mission of 1985. The Shuttle's payload was a military intelligence gathering satellite and the whole flight was shrouded in secrecy.

Discovery's launch was delayed by an unusual problem – ice! Normally sunny Florida was in the grip of Arctic weather on January 23 when the Shuttle was due to lift-off. The temperature at the Kennedy Space Centre was minus seven degrees Centigrade and ice had built up on the Shuttle.

NASA were worried that the ice would break off during launch and damage the notorious tiles, so the mission was postponed until the following day. The weather was warmer on January 24, so Discovery was able to begin its third flight.

The veil of secrecy that had originally surrounded the mission was lifted a little and NASA released television pictures of the crew and the launch. The exact launch time remained classified until nine minutes before lift-off. By then, it was too late for the Soviet Union to make any special arrangements to monitor the flight.

Regular news bulletins were issued every eight hours throughout the flight, but very little detail was given. Reporters were told that everything was going well – full stop.

Its job done, Discovery landed at the Kennedy Space Centre on January 27.

After the flight NASA indicated that the performance of the Inertial Upper Stage had been less than perfect. The first stage failed to place the satellite in exactly the right orbit. The error in position was only minor, but the satellite's own liquid propellant thrusters had to be used to position the assembly correctly before the second stage of the IUS could be ignited.

Flight Schedules

Shuttle launch schedules for the rest of the year are far from clear. Challenger was still due to take Spacelab 3 aloft on or soon after April 30 under the command of Robert Overmeyer. Pilot Frederick Gregory, Mission Specialists Don Lind, Norman Thagard and William Thornton and Payload Specialists Lodewijk van den Berg and Taylor Wang complete the crew.

Discovery will take three satellites into orbit early in June. Joe Engle will command the mission and Richard Covey is the Pilot. Mission Specialists will be James van Hoften, John Lounge and William Fisher. Patrick Baudry joins the crew as a Payload Specialist, after losing his seat in March. Saudi Arabia have been given the option of adding their own Payload Specialist to the crew, but have yet to announce their decision.

Spacelab 2 remains scheduled for July 9 aboard Challenger with Gordon Fullerton and crew. Roy Bridges will occupy the Pilot's seat. Story Musgrave, Anthony England and Karl Henize are the Mission Specialists. Loren Acton and John-David Bartoe will fly as Payload Specialists.

The plans for the rest of 1985 are rather confused. August and September may see two missions for commercial customers. The first of these will deploy the fourth Syncom IV satellite, the first Australian broadcast satellite Aussat-1 and the ASC communications satellite. Robert Gibson and Charles Bolden have been named as Commander and Pilot respectively. Franklin Chang-Diaz, Steven Hawley and George Nelson are the Mission Specialists. Payload Specialist John Konrad completes the crew.

Commander Brewster Shaw and Pilot Bryan O'Connor will take charge of the next flight. This will deploy the second Australian satellite, Aussat-2, the second Mexican Morelos satellite and the Satcom Ku-1 communications satellite. Mission Specialists will be Mary Cleave, Sherwood Spring and Jerry Ross.

The West German sponsored Spacelab D-1 may still make it into orbit in October, although this mission must be a candidate for postponement if the delays to other flights continue. Commander Henry Hartsfield, Pilot Steven Nagel, Mission Specialists James Buchli, Guion Bluford and Bonnie Dunbar, together with Payload Specialists Reinhard Furrer, Ernst Messerschmid and Wubbo Ockels will form the largest ever shuttle crew.

The Third Tracking and Data Relay Satellite was scheduled for launch in November, but NASA haven't managed to launch the second one yet. The exact nature of this flight is therefore still in some doubt.

The crew assigned at the moment comprises Commander Dick Scobee, Pilot Michael Smith and Mission Specialists Judith Resnik, Ellison Onizuka and Ronald McNair.

Remember Palapa?

This mission may include a reflight opportunity for Palapa B-2 which was rescued in November last year, but first of all the satellite's new owners have to find a buyer.

Michael Coats is waiting to hear when his crew of Pilot John Blaha and Mission Specialists Anna Fisher, Norman Thagard and Robert Springer will fly. They are due to launch the Westar VI-S and Satcom Ku-2 communications satellites. Current indications are that they may be in orbit around Christmas time.

One casualty of the revised flight manifest is the first Earth Observation Mission. This should have included a reflight of some of the Spacelab 1 experiments and flown in November. The mission has now been postponed until September 1986 at the earliest.

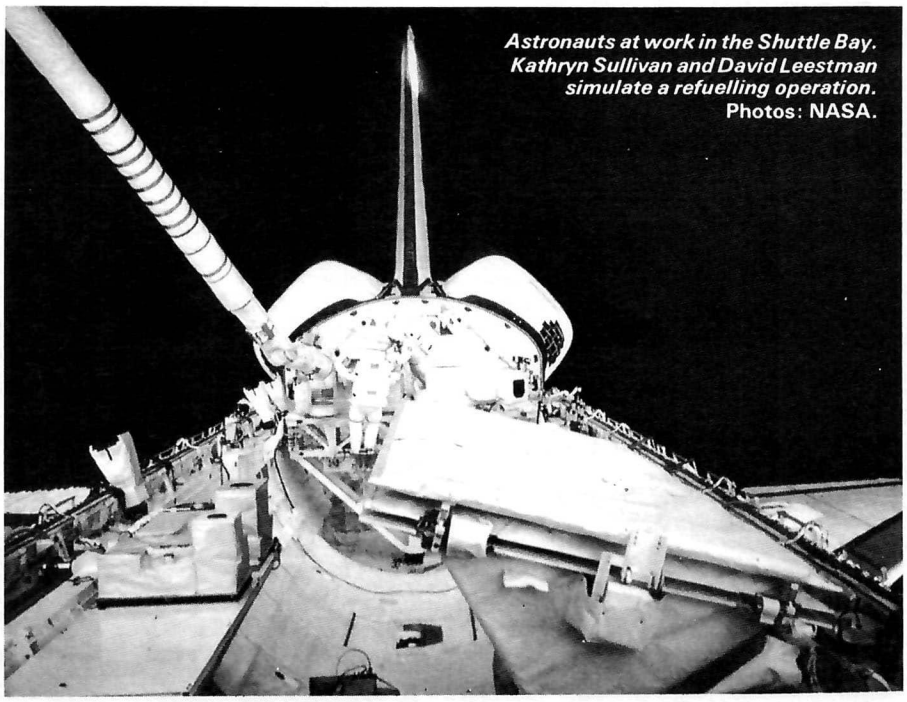
Two military Shuttle flights will also experience severe delays. The first of these would have marked the debut of the fourth orbiter, Atlantis. The new Shuttle orbiter was due to be delivered on 28th April ready for its maiden flight in November. This mission has now been postponed until January 1986, so Atlantis may be reassigned to an earlier flight.

The other military flight to be postponed is the first mission from the new west coast launch complex at Vandenberg Air Force Base. This will also be delayed until January 1986. The mission was due to be launched in October by the orbiter Discovery, but NASA have decided to retain Discovery at the Kennedy Space Centre to help catch up with the backlog caused by Challenger's absence.

The crew for the first mission from Vandenberg will be led by the experienced and extrovert Bob Crippen. Guy Gardner will be his Pilot and Dale Gardner, Jerry Ross and Richard Mullane are the Mission Specialists.

The launch facility at Vandenberg is unlikely to be used to its full capacity. It is designed to handle ten Shuttle launches a year, but at the moment plans call for only two launches in 1986, one in 1987 and no more than four in 1988.

1986 should be an exciting year for the Space Shuttle programme. The Astro-1 package to observe Halley's Comet will be carried aloft in March and the Ulysses solar probe and Galileo mission to Jupiter should be sent on their way in May. The year should also see the deployment of the Hubble Space Telescope and the flight of the first British astronaut.



Astronauts at work in the Shuttle Bay. Kathryn Sullivan and David Leestman simulate a refuelling operation. **Photos: NASA.**

Communications Bank

Kill the Dead

Space Voyager is continuing to live up to and even exceed its early promise, issue 13 was excellent.

My thanks in particular for the *Blake's 7* related articles and the interview with Tanith Lee. I have found her work evocative and highly emotional, and the thought of her writing a *Blake's 7* sequel as 'Casablanca in Space' is pure magic! But why, as the interview referred to both her *Blake's 7* episodes and *The Silver Sky,* was there no mention of *Kill The Dead?*

Keep *Space Voyager* on its present heading – its definitely the right course!

St Guthlac Street *Ann Godfrey*
Hereford

Kill the Dead, *for the information of readers who might not know, is the Tanith Lee book which she wrote especially for Paul Darrow and Michael Keating, with the two central characters Parl Dro and Myal Lemyal very closely tailored on the two actors. Paul and Michael fans might be interested to hear that they were together on stage in a short tour of* Don't start without Me *last year.*

Oh yes we do!

I enjoy *Space Voyager* immensely, but unfortunately it is difficult to get up here in Edinburgh. The only place is the Science Fiction Bookshop which gets every issue – and on time.

My problem is that I've missed some issues and you don't print back issue order forms.

Colinton Road *Michael*
Edinburgh *Henderson*

Oh yes we do, Michael, as from the last issue! As a certain member of the A Team *says 'I love it when a plan comes together' and this is just another of those times when we get a letter from a reader saying 'why don't you . . . whatever' just as we've decided to do something.*

Sadly we don't have any stocks of the early issues of Space Voyager *left. With the plug you'll be popular with your SF bookshop, so why not try mentioning to them you'd be interested in second-hand copies if they hear of any available?*

Brum Modeller

I have been SF modelling for a number of years now and I have been unsuccessful in finding anyone who does the same thing as myself in the Birmingham area. Even if we meet in my shed it would be a start, maybe, of a new club.

35 Ludlow Road *M Abraham*
Alum Rock
Birmingham

Well, are there any modellers in Birmingham? There is the Birmingham SF club – Rog Peyton will be able to give full details. (Andromeda Bookshop)

Star Flaws

I must thank you first of all for a very informative and interesting magazine – it's been the only mag that I've bought from the first issue, and that says something in itself! However, I have run into a problem in that I missed issue 12 and having searched around newsagents, cannot find it anywhere. Can you help me out at all?

I particularly enjoy reading your film reviews, Letter from Hollywood and Read Out, the last of which has prompted me to buy several books I would not otherwise have done.

I am a great *Star Wars* fan and recently have had it on the brain, reading everything and anything I can, so whatever *Space Voyager* prints on the subject is greatly appreciated. I think the Saga holds a definite mystical value. However, continuing Star Flaws from issue 7, what happens to the last stormtrooper, in *A New Hope,* just as Luke prepares to swing across the air circulation shaft with Leia? Without being shot, one frame he's there and then the next frame he's not! As a final note, how about some profiles on your writers? they do such a great job?

Brill *Adam Dilly*
Bucks

Sorry to hear you are having trouble getting your copy of Space Voyager, *Adam. Most newsagents should be able to order you a copy, and if you still have problems, then let us know which newsagent is most convenient to you and we'll try to sort something out.*

Delighted to learn that Read out *influenced your book-buying, but you didn't say whether you'd enjoyed the books . . .*

Okay, we've had 2001 *Blunders, now I can see we're back to Star Flaws. Anyone else got any more? I liked the one shown on the* Late Late Breakfast Show *where the Storm Trooper charged through an opening door and just about brained himself – so that's why they wear the helmets!*

Do you really want to know more about Space Voyager's *contributors? We're a modest bunch.*

'Brained me? Hah, I missed all my vital spots!' Do you know any more 'Star Flaws'?

Anderson Fan

I'm an avid fan of all things Anderson (*Thunderbirds, Stingray,* etc) and would like to know if any clubs or societies exist, especially any holding regular meetings in the Cleveland area. If so, could you please print their addresses?

15, Tedworth Close, *R Pluck*
Guisborough
Cleveland
TS14 7PR

The main Gerry Anderson fan group is Fanderson – Pamela Barnes, PO Box 308, London W4 1QL. Any fellow fans in Cleveland? You could also try subscribing to SIG, *the Anderson magazine – details from 13 Primrose Avenue, Blackpool FY4 2LJ.*

From Down Under

We're a month behind in receiving our copies of *Space Voyager* out in the colonies, so may I make some late comments on issue 11?

Firstly on Gerry Anderson's work – may I submit my list of preferences?

1 – *Joe 90* (1968) (shown here in 1978)
2 – *Captain Scarlet* (1967) (here in '71)
3 – *Thunderbirds* (1965-66)
4 – *UFO* (1969-70)
5 – *Stingray* (1962-63)
6 – *Space 1999* (1975-77)
7 – *Supercar* (1959)
8 – *The Secret Service* (1968-9)
9 – *Terrahawks* (1983)

To me the first four have the best scripts and best technical work of the lot, although all have redeeming episodes.

Pitt Street *D F Stuckey*
Raetihi
New Zealand

Lovely to hear from someone from as far away as New Zealand, and, since you're a Gerry Anderson fan, I hope you're enjoying David Nightingale's series on his work.

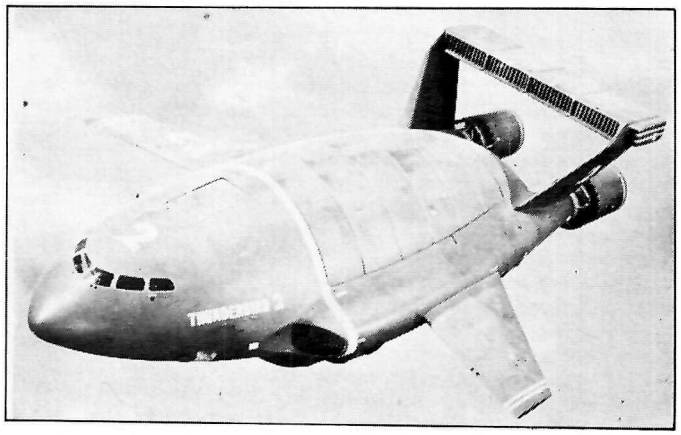
You also mentioned in your letter a request for stills of Stingray *and other shows showing the vehicles – hope you enjoyed the colour one on the back of issue 14, as well as all the ones inside.*

Blueprints are also available for the Terrahawks *vehicles – see products section this issue.*

But what I want to know about is what the fan scene is like in New Zealand – write again Mr or Ms Stuckey, and tell us – do you have clubs, what's on TV, do you have conventions? How many of you are there?

Enterprise Captains

This is the first time I have ever written to a magazine of any sort, but after reading yours I have built



Communications Bank

up enough courage to try.

This bit of information is for anyone who is a *Star Trek* fan. I wonder how many fans know just how many Captains were in charge of the Enterprise. To my knowledge there have been five captains, and, in order of command, they are:

1 – Robert April
2 – Christopher Pike
3 – James T Kirk
4 – Decker
5 – Spock

For reference I used *Star Trek the Role Playing Game* and the movies.

Ardeer *Mariyon Juratovac*
Victoria
Australia

Another letter from 'Down Under'! The remarks on that letter pertain – Australian readers, please, tell us what happens there.

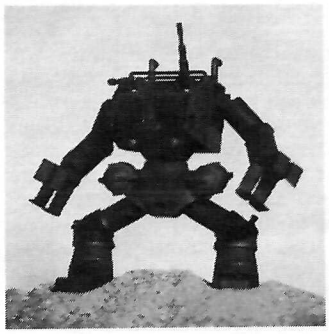
'Captain, we're getting a strange reading on the forward scanner. It looks like. . .a creeping bloodstain'

Weirding Modules

I found *Dune* the film somewhat disappointing in comparison to the book especially in respect of the total invention of the 'Weirding modules' which in my opinion were total farce.

I enclose a picture of my Bandai Wm Crab type 1/144 scale robot.

Ashby Road *Kevin Payne*
Loughborough



Creeping bloodstain!

Has anyone noticed the crawling bloodstain in *The Wrath of Khan?* As we see Kirk in the sick bay with the space cadet laid out, he reaches out his hand and touches the bottom of the white fold on Kirk's tunic and leaves a bloodstain. Then in the next scene, with Kirk on the bridge the stain has moved up to the centre of the fold. I am not picking holes in this otherwise excellent film, but I thought it was a bit obvious.

Being a *Trek* fan, I am annoyed that there has never been (to my knowledge) a *Star Trek* convention down here in the south. They are always up north.

Spring Lane *Kevin Davis*
Golden Common
Twyford
Hants

Okay, we had so much fun with the 2001 *blunders, how would you all like to now send in your* Trek *clangers, such as the one above?*

As to conventions being mainly in the North . . . they tend to be so, mainly because they're central for everyone. There are conventions in the South though not Trek *ones – see this issue's Con Data.*

Stardates

I write with regard to Phillip Rochester's letter in *Space Voyager* 13 concerning the puzzlement over Stardates in *Star Trek.* Wendy Graham commented that these 'scriptwriting devices' were artificial and had no meaning. I have been led to believe, through various publications, that Stardates were originally developed to combat the confusion caused when a Starship, operating on Earth-time, encounters a civilisation that uses a totally different time measurement, the confusion worsening the more planets the Federation encountered.

The Stardate was therefore introduced not only as a universal measurement of time for all sentient beings under the Federation wing but also as a system of reference, combining date, hour, speed and location of a Federation Starship to enable the Captain (or other officials) to identify the entry in his log.

The Green *Simon Goodall*
Westerham
Kent

I was going by the Great Bird himself, as quoted on Stardates in The Making of Star Trek, *from page 197, and since Gene Roddenberry must surely be regarded as* the *source on* Star Trek, *I stand by my answer.*

Neverending omission

May I, through Communications Bank be allowed to set the record straight regarding the production art for *The Neverending Story?* Readers who have the film-art book, *The World of the Neverending Story,* will see that Earnie Kollar is given the credit for all of this; but in fact the paintings on pages 37, 38 (top) and 98 (top) are mine. Neither Earnie nor I know why my name was omitted (typographical error, I suppose!). As is mentioned in the article in *Space Voyager* No 14, I worked on the movie in October and November 1982. I could have done a dozen paintings in that time, but each had to be approved by the producer – who was always somewhere else . . . I was joined by Earnie, who is an American living and working as a painter in Munich.

Birmingham *David A Hardy*

Convention endorsement

Space Voyager provides a wide range of articles, all of which are fantastic.

I can certainly endorse going to conventions. I went to my first one last September, thanks to *Space Voyager* and really enjoyed myself.

Might I suggest that anyone who goes to a convention for the first time should aim for somewhere not too far from home as it saves travel complications.

Goole *Leah Turner*
N Humberside

Conventions are usually organised in large towns and cities, often in the middle of the country, so that travelling is fair for attendees. I hope Leah, that your first won't be your last and I'll hope to see you at one soon.

Trek III thoughts

After recently seeing the third *Star Trek* film on video, I must admit that this, in my opinion, is the best to date. (Some might argue that *Trek II* was the best. I don't think that anyone will say that the first was.)

The acting of the eight regulars was good all round – even Janice Rand's (Grace Lee Witney's) brief appearance; and it was nice to see Sulu and Uhura getting more to do than usual (I think the influence of Nimoy helped them there). As usual Kirk and McCoy had plenty to do with Scot coming off next best as always.

Even Spock's moments on screen, towards the end, adequately made up for his non-appearance (Nimoy as Spock that is). A pity that Chekov didn't get much to do this time round.

It is a great pity that Janice Rand didn't appear in most of the film. She's just as important to *Star Trek* as the other regulars, and should have been treated so. Will she be better off in this respect for the fourth film?

For that matter will the other (ninth) regular, Christine Chapel be appearing at all? Could you also tell us what the new ship – if any – will be?

Finally is it possible to order a back issue – number 9?

Bury *Ian Fishwick*
Lancashire

Phew! Lots of points there, Ian. As you'll see from my review elsewhere in this issue I'm a bit 'iffy' on the plot of Search for Spock, *and I thought it a bit of a shame that they went through the 'He's dead . . . No he isn't' routine for both films – with the 'what about the ship?' question still to come. (Sorry, I don't know which ship.)*

I agree about Grace Lee and Majel Barrett Roddenberry – let's hear it for them for the fourth.

To be honest, in the acting I thought they were all a touch Vulcan . . . Nimoy's influence again.

There were parts of Star Trek: The Motion Picture *which I enjoyed, and I thought it improved greatly with the* Special Edition – *the re-cut version, which was the one shown on TV, and which cut down on the SFX and upped the dialogue a bit.*

You certainly moved fast to see the film and get your letter in, by the way, but then all our readers seem to communicate with us at warp speed!

Dr and Dog

BOBBY WOODER TAKES US THROUGH THE ASSEMBLY AND PAINTING OF TWO OF FINE ART CASTINGS WHITE METAL FIGURES FROM DR. WHO.

'Would you like a jelly baby?' K9 complete, Doctor at the half-way stage.

Fine Art Casting and **BBC Enterprises** are responsible for the white metal figures which build into a *Doctor Who* collection. So far issued are Tom Baker's Doctor, Leela, K9 and a Cyberman.

As with just about all white metal figures there are very few parts to worry about, so, just to make things a bit more interesting I added K9 to my review Doctor. Only an hour or so is needed to build the figures ready for painting.

First check for and very carefully remove any moulding flash, mould marks or burrs with a strong sharp modelling knife, finishing off with a few needle files and wet and dry sandpaper.

The only mould mark lines were on the Doctor's hair and shoulders and on K9's head. The Doctor's head was not quite flat enough to accept his hat but a few deft strokes with a file soon cured that headache.

Remember the metal must be really clean and bright or the joints will not stick together properly. It is better to scrape or file the joints clean than to use a big unsightly blob of glue – the best type of glue I have found seems to be five-minute epoxy – it seems to do the job better than some of the specialist glues I have used.

When the good Doctor's arms were fitted there were gaps which I filled in with Milliput and smoothed with a file when dry.

A primer should be used before painting, any good primer will do, but car spray primer is ideal.

K9 was given a black wash then drybrushed over with **Humbrol** Gunmetal. I mixed matt black with Gunmetal for a darker shade and painted the recessed edges of the legs.

Painting K9

His eyes were painted Signal Red and the keyboard on K9's back was drybrushed red, yellow and blue. The K9 lettering, name disc and 'ears' were painted silver and the all-round bumpers were painted satin black. Finally his collar was painted red, green, yellow and blue to represent tartan.

The Doctor was also given a black wash but only on his hair, hands, sweet bag, scarf and trousers. First the eyes and teeth were painted white, then the pupils brown. Correct any mistakes carefully and paint the eyebrows browny-black. Mix a dark flesh and paint the lips, under the chin, each side of the nose and the smile lines and dry brush the hands.

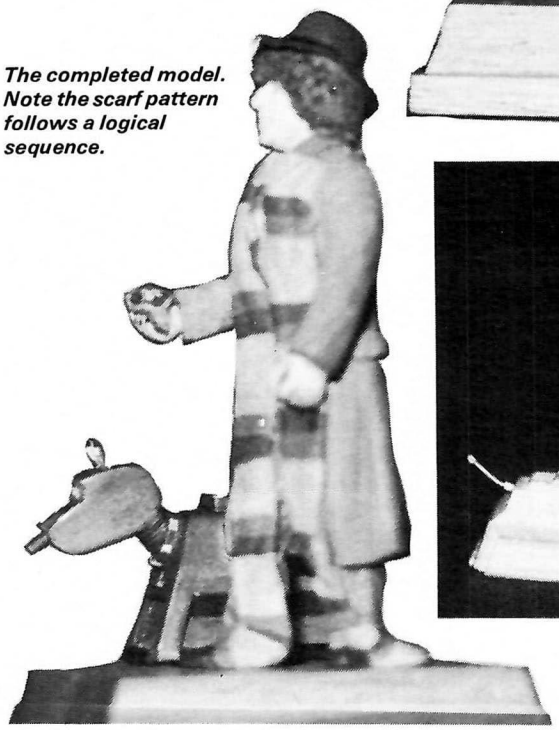
Now you can drybrush the highlights with a pale flesh colour on the nose, cheeks and chin and finish off with a touch of matt white.

The Doctor's coat should be a burgundy colour, so mix matt black and matt Brick Red to get it. Paint the coat all over, then add some more red to get a lighter shade and carefully drybrush over the coat. Then add even more red for an even lighter shade for the highlights.

The trousers get the same treatment – dry matt grey then drybrushed with a lighter shade of grey.

The Doctor's hair still has the black wash so mix a dark satin brown and liberally drybrush the hair so that most, but not all, of the blackwash is covered.

Now mix in some yellow two lighten the brown. Do not use white or you will get a horrible pinky brown colour. Gently drybrush the lighter shade here and there for highlights in the hair. The hat and shoes come next. Three shades of brown and don't forget to paint under the hatbrim! Paint the shirt white and the neckerchief red.



The completed model. Note the scarf pattern follows a logical sequence.

The unpainted model. Purists may enlarge the hat with Milliput. **Photos: The Author.**

That scarf!

Now we come to that scarf. I used four colours, red, green, purple and stone yellow. I also mixed two lighter shades of each for highlights.

Remember the colour patterns on the scarf – if you start on the lefthandside with red, green, purple and yellow the right side must be yellow, purple, green and red – otherwise it will look like two scarves joined in the middle.

Finally, the sweet bag. Don't use white but rather three shades of grey. Paint the Jelly Babies whatever colours you like!

Spray the finished figures with matt varnish carefully avoiding the hair, hat and shoes. Spray those with satin varnish. If you don't have an airbrush you can use a Humbrol minispray.

Lightly mark with a pencil where you will place the Doctor and dog on the varnished wooden base and carefully scrape away the varnish. Mix some epoxy and glue the Doctor and K9 to the base.

What I did not like about the Doctor figure was that the hat seemed three sizes too small, his nose was, to put it mildly, too big, his face is chubby and his hair looks like it hasn't been cut for two years. The scarf is just too wide and too thick. This is probably due to the way the figure has been cast, though it might have been better if the long sections of the scarf had been cast separately as it would have looked better and painted up more easily. But on the whole it makes a pleasing and rewarding model for the display shelf.

READERS SURVEY

OPEN SPACE

Here's your chance to tell us what you think about *Space Voyager*. We think it's great – you tell us otherwise and we might just send the boys round, armed with a year's supply of Voyagers – FREE (see Q.33).

Postage is free for this sheet, if it is sent from within the UK.

1. Age
   15 or under ☐
   16-20 ☐
   21-30 ☐
   31-40 ☑
   41-50 ☐
   51-60 ☐
   Over 60 ☐
   Male ☐
   Female ☐
   Single ☐
   Married ☑

2. Status: Are you. . .
   School student ☐ College/University student ☐
   Unemployed ☐ Employed ☑
   Other.....

3. How regularly do you buy *Space Voyager*?
   Every issue ☐ Fairly often ☐ Occasionally ☐

4. Which was your first issue of Voyager (including the Pilot Issue)?.....

5. If you buy *Space Voyager* 'off the shelf', do you ever have difficulty obtaining a copy?
   Often ☐ Sometimes ☐ Never ☐

6. Name and address of regular newsagent.....
   .....
   .....

7. Which other magazines, if any, do you buy regularly?.....
   .....

8. Which comics or newspapers do you buy?.....
   .....

9. What topic, of a Voyager nature, interests you most?
   .....

10. Specifically, do you think there should be more, less, or the same amount of the following in *Space Voyager?*

	More	Less	Same
Science Fact	☐	☐	☐
Science Fiction	☐	☐	☐
Media (Films, TV)	☑	☐	☐
Modelling	☐	☐	☐
Role Play Gaming	☐	☑	☐
Reviews	☐	☑	☐
Interviews	☐	☐	☑
Competitions	☐	☐	☐

11. What do you think of the following regular features?

	Good	Fair	Poor
Captain's Log	☐	☐	☐
Data Bank	☐	☐	☐
Communications Bank	☐	☐	☐
Read Out	☐	☐	☐
Products	☐	☐	☑
Classified Ads	☐	☐	☐
Cartoons	☐	☐	☑

12. What other subjects would you like to see covered?.....
    .....

13. What do you think generally of the design of Voyager?
    Good ☐ Fair ☑ Poor ☐

14. Which were your top three favourite covers?
    1st) Issue....., 2nd) Issue....., 3rd) Issue.....

15. How does this issue of *Space Voyager* compare with previous issues, in your opinion?
    Better ☐ Same ☐ Worse ☐

16. If better or worse, why?.....
    .....
    .....

17. Which were your favourite three isues of Voyager?
    1st) Issue....., 2nd) Issue....., 3rd) Issue.....

18. Have you ever answered a classified ad in *Space Voyager*?
Yes ☐ No ☐

19. a) Have you ever answered a commercial ad in *Space Voyager*? Yes ☐ No ☐
b) If yes to a), were you satisfied with the service? Yes ☐ No ☐
c) If no to b), please specify company and complaint.....
.....

20. a) Do you own a home computer? Yes ☐ No ☐
b) If yes, what model?.....

21. a) Do you own a video? Yes ☐ No ☐
b) If yes, please state model and system.....

22. Do you prefer to go to the cinema ☐ or see a film on video ☐?

23. a) List your favourite films.....
.....
.....
b) List your six favourite TV programmes.....
.....
.....

24. Do you have a local model/hobby shop which satisfies your needs? Yes ☐ No ☐

25. Are you a member of any clubs or societies? Yes ☐ No ☐

26. Do you attend conventions (such as Games Day, Dragonmeet, Galacticon etc.)? Regularly ☐ Sometimes/When Possible ☐ Never ☐
b), If not, why not?.....

27. a) Do you retain back copies of magazines such as *Space Voyager*? Yes ☐ No ☐
b) If yes, do you prefer to keep them loose ☐ or in binders ☐?

28. Who is/was your favourite Voyager contributor?.....

29. What is your earned income

None	☐	£10,000-£12,999	☐
Under £500	☐	£13,000-£14,999	☐
£500-£3,999	☐	£15,000-£20,000	☐
£4,000-£6,999	☐	Over £20,000	☐
£7,000-£9,999	☐		

30. What is the income of your spouse?

None	☐	£10,000-£12,999	☐
Under £500	☐	£13,000-£14,999	☐
£500-£3,999	☐	£15,000-£20,000	☐
£4,000-£6,999	☐	Over £20,000	☐
£7,000-£9,999	☐		

31. What credit cards, if any, do you hold?

Access	☐	Visa	☐
American Express	☐	Any Gold Card	☐
Diners Club	☐	Other.....	

32. If you wish to participate in the competition below, please give us your name and address.....
.....
.....
.....

33. Trying to disregard personal preference, in what major way(s) do you think *Space Voyager* could be improved, in either content or design? The senders of the three most practical, innovative and legible ideas will each receive a year's FREE subscription to *Space Voyager*. The Editor's decision is final, and all entries must be in by 15th June, 1985.
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DOCTOR IN DISTRESS

TONY CHERRINGTON, OF 'LINK-UP' PROVIDES AN EXCLUSIVE INSIGHT INTO THE BBC'S SHELVING.

Whenever Dr Who regenerates there is always the chance of the Doctor going through a regeneration crisis. Although we have never seen this we have heard it mentioned by Tom Baker and Peter Davison.

Dr Who fans are always prepared for newly-regenerated Doctors to at first be erratic and unbalanced, but nothing prepared us for the shock of Colin Baker's regeneration.

Instead of the Doctor having the crisis it was we *Dr Who* fans. The BBC announced that *Dr Who* was being taken off our screens for 18 months and would not be back until Autumn 1986.

When the news was announced I was in Southampton visiting a fellow fan. We had been watching *Who* videos so we had not seen the news. When I got home I collected my mail and over 800 telephone messages from a rather irate switchboard operator.

For those of you who do not know me I run a *Blakes 7* and *Dr Who* fan club so a majority of the messages were from members – there was even one from my mother who (doesn't even like *Dr Who*!)

I immediately rang the BBC and spoke to John Nathan-Turner (producer of *Dr Who*)'s secretary, Sarah Lee. She confirmed the news.

My club, Link-up, was formed in 1981 and since then we have been friendly rivals with the older Dr Who Appreciation Society. But this was one time we could not let our petty arguments and competition get in the way, so we decided to join forces against the BBC's decision.

Inside Rumours

On February 27, when the BBC announced the decision to 'pause' the show for 18 months there were many rumours from inside the BBC as to the reasons for the decision.

The two main ones were a) that the decision was a publicity stunt or 'tool', if you like, to try and convince the Government to give the BBC a hefty TV licence rise to £65 which they wanted, or b) that Michael Grade would, after 18 months, cancel the show for good. So *Dr Who* fans would have nothing to fight with, after such a long break.

Moves have been afoot to cancel *Dr Who* since 1980 when Tom Baker announced that he was leaving. Rumour has it that a decision was made to cancel the show when he left but John Nathan-Turner persuaded the BBC chiefs to change their minds and so we were introduced to Peter Davison's Doctor. During Peter's three years, *Dr Who* went through a lot of experiments – companions, characterisation, episode length and so on.

I was obliquely warned by a member of the *Dr Who* cast last year that the programme was to be cancelled.

Nevertheless the *Dr Who* team had been aware for some time that the programme was at risk, but the news, when it came, came very suddenly. It was still, therefore, a great surprise and many members reacted with stunned disbelief. Their surprise was understandable since the audience figures, which had slumped over the last few years were picking up and the programme was collecting its highest ratings for four years.

That the move had been planned for at least a short time before the announcement by the powers-that-be was evidenced by the fact that the day after the announcement pay-off cheques for their already signed next year's contracts were given to Colin Baker and Nicola Bryant (Companion Peri).

History repeats itself

Who producer John Nathan-Turner now found himself in much the same position as that faced nearly 20 years ago by another SF TV producer whose programme faced the axe. Just like Gene Roddenberry he could not lend his support to fans efforts. The cast was similarly constrained.

Dr Who has over 110 million viewers worldwide. The news was announced on February 27, by March 2 the BBC had over 80,000 complaints by letter and telephone.

After several telephone calls I had spoken to the leading figures in *Dr Who* fandom, David Saunders of DWAS and Ron Katz from America.

While *Dr Who* fans in the States wrote to and rang the BBC they also raised money, and very quickly collected donations to save *Dr Who* and are believed to have raised £1½ million which is enough money to keep *Dr Who* going for five years.

Meanwhile British fans have contacted local press and TV stations and one fan has even produced a *Band-Aid* type record called *Doctor in Distress* by a collective group called *Who Cares* and made up of well-known pop celebrities as well as *Dr Who* team members.

To add fuel to the rumour that to shelve the show had only been a first move towards cancelling the show for good, Bill Cotton, Managing Director of BBC TV rang David Saunders to give him a personal promise that *Dr Who* would be back in 18 months.

The reason behind the cancellation of the show we may never know. It is inexplicable, especially when you look at the figures. The BBC want to raise the TV licence fee from £46 to £65 (Editor's note – they haven't got it).

Dr Who costs an average of £180,000 PER SERIES to produce. The BBC sells *Dr Who* to 54 countries and makes more money from that and merchandising than it costs to make.

***Nicola Bryant and Colin Baker. The last faces of* Dr Who *that we're likely to see for a while.* Photo: W. Graham.**

A recent Lionheart (BBC sales wing for overseas) sales promotion leaflet says in favour of the series:-

1 Longest running SF programme in TV history.
2 Flexibility in scheduling, playable in many day parts.
3 New episodes every year (sic).
4 Strongly supported by national and regional fan clubs.
5 Entertainment for the entire family.
6 Perenniel story lines, that classically combine comedy, drama, adventure and SF.
7 Endless possibilities for series to continue indefinitely (sic).
8 Popular supporting characters, monsters and villains.
9 High quality BBC entertainment values.
10 Seen weekly by over 100 million people in 54 countries.
11 470 half hour and 100 feature length movies now available.

These pamphlets were on their way to the States on March 2 when I was given one.

Whatever the reason behind the move to cancel *Dr Who* all *Who* fans must stop arguing and fight in unison to get it back on the screen as soon as possible.

Build a DEATH STAR

AFTER LAST ISSUE'S *EXECUTOR*, DON AFFUSO PROVIDES DETAILS FOR ANOTHER *JEDI* PROJECT FROM SCRATCH.

Although there are seemingly endless *Star Wars* products on the market, there are plenty of omissions which give the scratchbuilder opportunities to attempt his own version of a particular craft. The Death Star from *Return of the Jedi* is one such, and it shouldn't be too difficult for any reasonably competent modeller to make.

The main components of my own model are two six-inch **Plastruct** hemispheres, and the first step to achieving the 'half-built' look is to cut these to the approximate shapes shown in drawing 1. Cut and file a circle in the appropriate place to accommodate the weapon dish (a Plastruct VHD-200), and glue into place with Plastic Weld, filling and sanding the joint until it is smooth. The VHD-200 is slightly larger than it should be to allow for the thickness of the plastic.

The thickness of the Plastruct parts is also a drawback for two other reasons; it is difficult to cut to a complex outline, (I used a mini hacksaw blade), and it is far too gross to represent the 'skin' of the Death Star at this scale. The only way around this is to model the exposed edge parts out of thin plastic sheet using the following technique, which was explained to me by a most helpful Plastruct employee. Younger modellers are advised to enlist the help of an adult as this method can be *very* dangerous.

The method

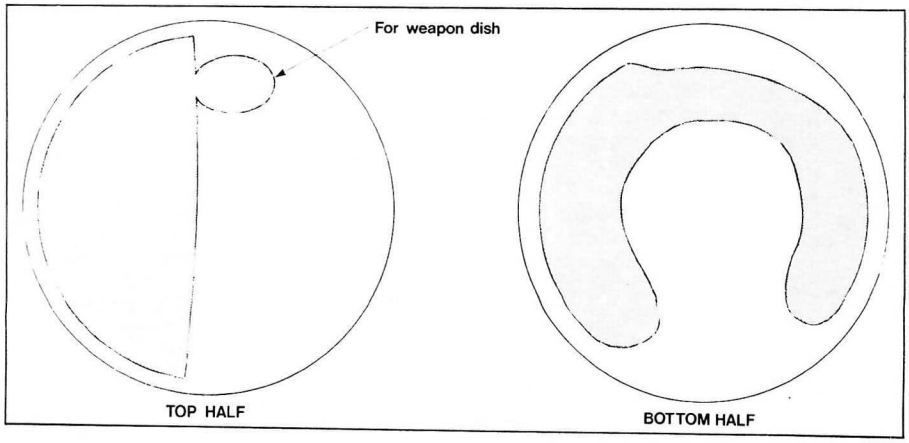
Cut a number of two to four in wide strips of 20 thou plastic sheet. Heat up some cooking oil in a chip pan until the sheet goes limp as soon as it is dunked in the oil, then drape the hot plastic over the hemispheres and leave to cool, (obviously it is easier to do this *before* you cut the hemispheres). You should end up with several pieces of thin plastic which, except for a few wrinkles, follow the curve of the Plastruct domes. Wash all parts until they are free of oil and dry them thoroughly.

The next step is to cut these pieces ready to be attached to the hemispheres, and to follow the intricate outline which represents the completed section of the space station. This is best achieved by referring to photographs, but since the film and most pictures only ever show one view, the 'rear' has to be improvised.

To join the 20 thou plastic card parts to the Plastruct domes it is necessary to provide a backing for support, so using more of your moulded sheet attach a strip to the *inside* edge of the dome so that it protrudes by about 5 mm. Then build this up with further plastic strips until, when the curved sheet is glued on top of this, it lies perfectly flush with the outside of the dome. All joins must then be filled and sanded with fine wet'n'dry paper, and redone until they are virtually invisible – unfortunately, you may not be able to tell until the model is painted, in which case the process must be repeated.

Now to the Star's interior, the exposed 'floors' that are supposedly under construction. For this you will need several sheets of 20 thou plastic card, about 25 Plastruct I-beams, and a great deal of patience.

Cut a circle of plastic to fit inside the hemispheres at their widest point. Cut another circle, fractionally smaller, and glue it on top of the first, separated by the I-beams and perhaps some oddments of 60 thou plastic card for strength. Repeat this, but each time cut irregular indentations into each 'floor' –

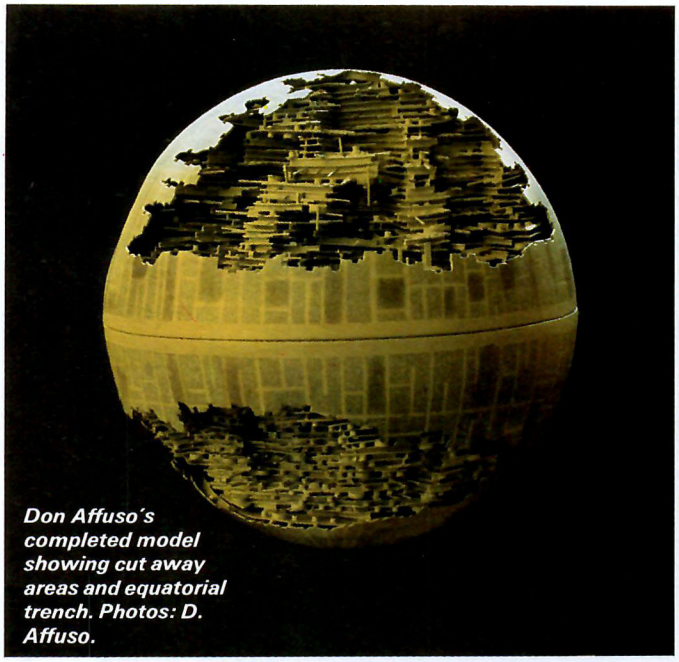


some to match the previous layer, some not – and carry on until you fill the hemisphere. Regular test-fitting is essential at this stage, and again, because there are no pictures available for reference, how you do it is a matter of personal choice. The lower half is considerably more complicated as there is more of the Death Star's interior exposed. Detail may be added to these sections with assorted pieces of scrap plastic, and something I find particularly useful here is the various-sized circles which can be cut from plastic card with a leather punch.

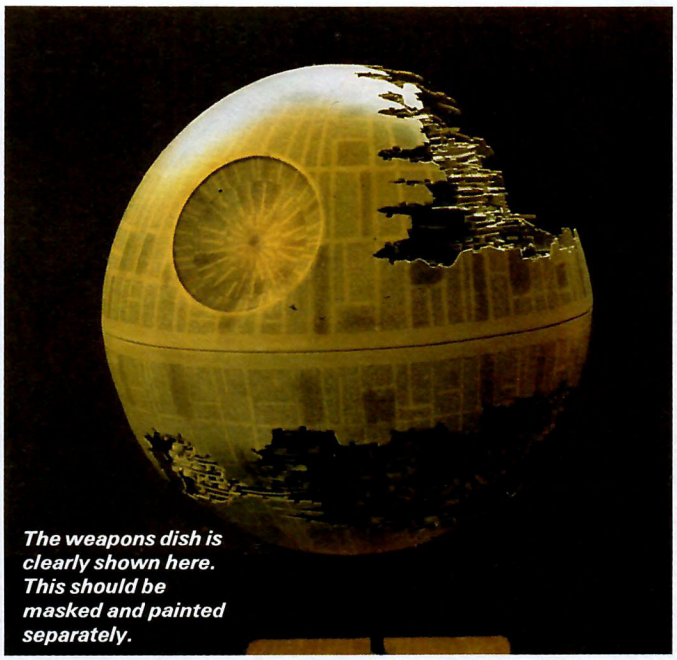
'Equatorial' trench

Before the two halves are joined, think about how the finished model will be supported and prepare it accordingly (mine is held by a metal rod at the 'back'). Then cut a ring of flat 20 thou plastic card and cement it between the two hemispheres, recessed slightly, to form the characteristic equatorial line. Spray the model pale grey (B7-BR Wagon Grey from the Precision Paints range), and use the reflections in the wet paint to check for any unacceptable ridges where joins have been made, then the detail painting can begin.

Working a quarter-hemisphere at a time, cut thin strips of masking tape with a sharp craft knife, and stick these so that they converge at top centre like lines of longitude. Attach shorter bars horizontally at random intervals, mask the remainder of the model,

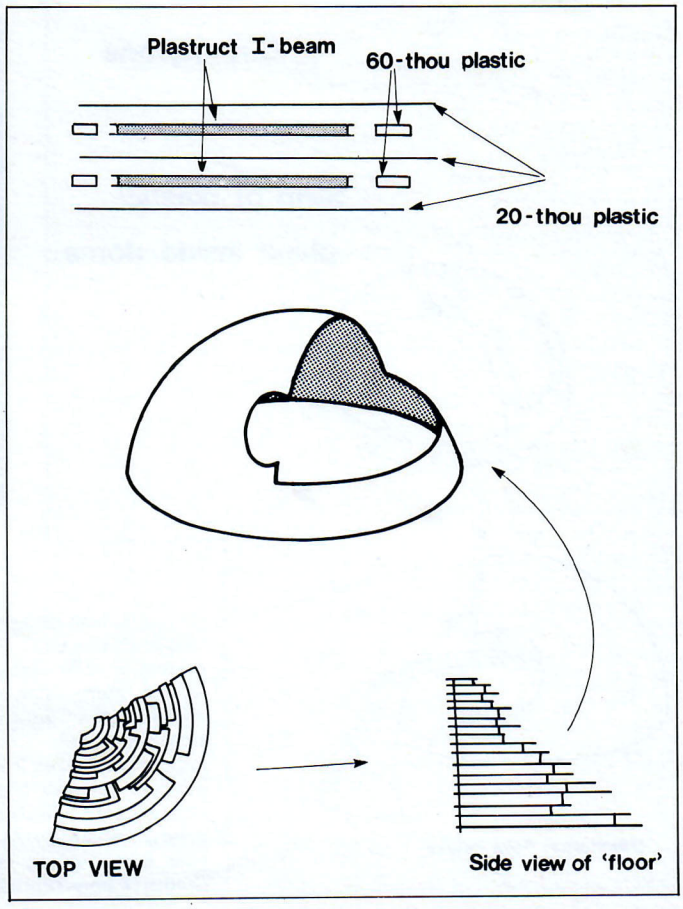


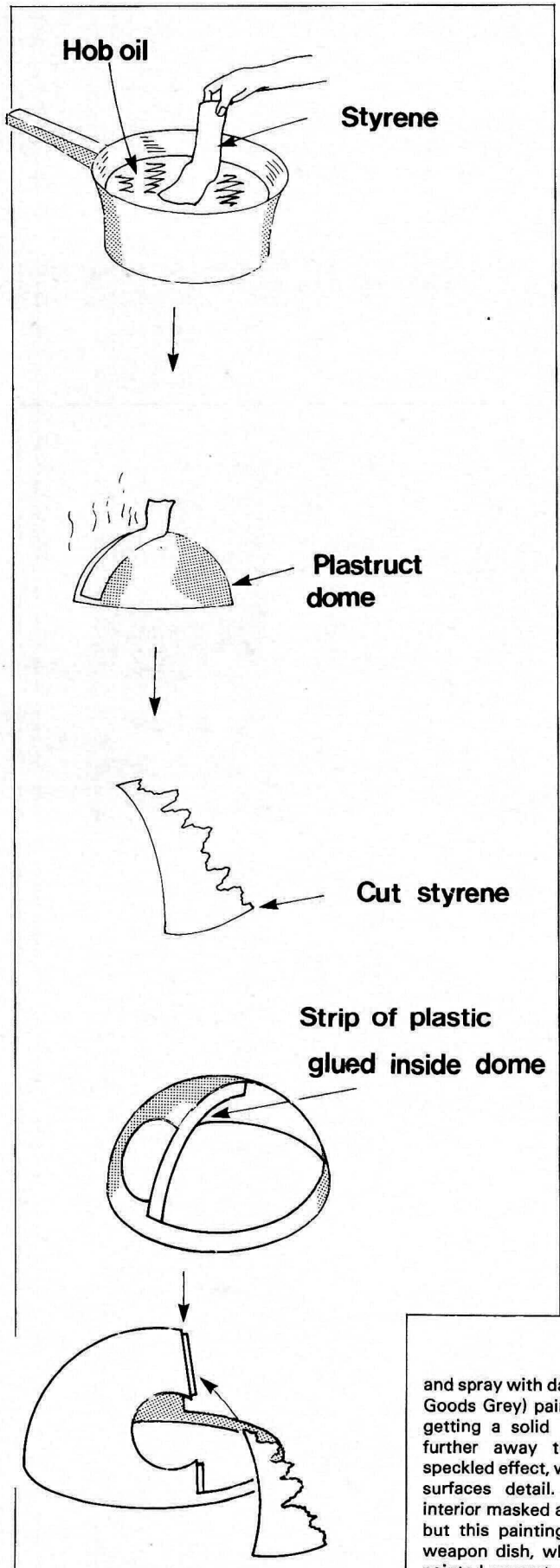
Don Affuso's completed model showing cut away areas and equatorial trench. Photos: D. Affuso.



The weapons dish is clearly shown here. This should be masked and painted separately.

Close-up of interior detail.





Diagrams: Pete Taylor.

and spray with dark grey (Precision B17-GWR Goods Grey) paint. The trick here is to *avoid* getting a solid colour, so hold the aerosol further away than normal to achieve a speckled effect, which gives the illusion of fine surfaces detail. While painting, keep the interior masked as it should remain pale grey, but this painting technique is used for the weapon dish, which is best masked off and painted separately. As a final touch, dry brush over some of the dark grey with various shades of powdered pastel, and secure with a coat of matt varnish.

Scratchbuilding can be a frustrating business, but if you are prepared to take your time and make good any mistakes, it can also be a very rewarding experience – the pride of displaying a handbuilt model far outweighs that of a commercial model – but if you really can't face weeks of fiddling with tweezers, you can always just stick the two domes together and end up with a perfect model of the Death Star as it appeared in *Star Wars!*

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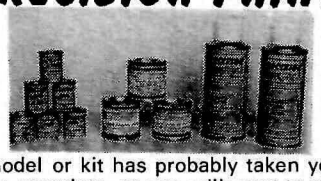

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BACK ISSUES

The following issues of *Space Voyager* are still available at a cost of £2.00 each, including p&p. Please allow 28 days for delivery.

ISSUE NO 14. APR/MAY, 1985

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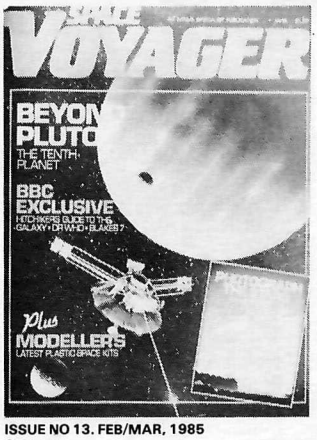

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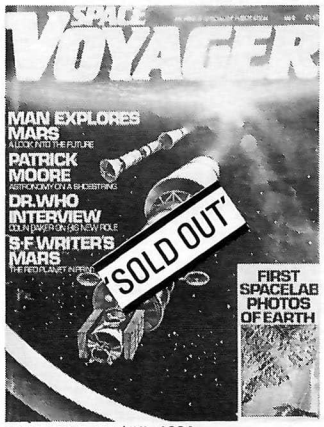

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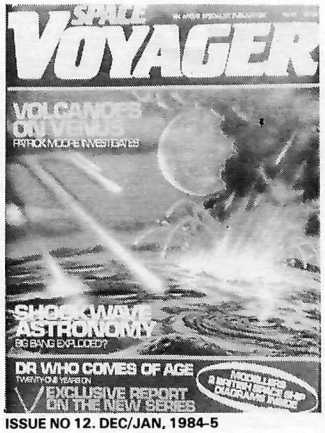

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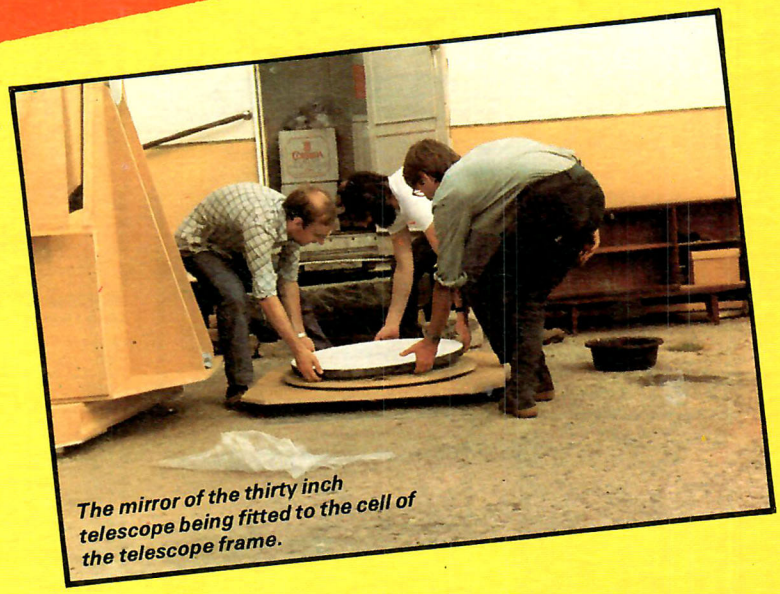
BUILDING A DREAM

RIC WICKHAM REPORTS ON AN UNUSUAL D.I.Y. OBSERVATORY IN THE PENNINES.



The mirror of the thirty inch telescope being fitted to the cell of the telescope frame.

High on the Pennines, between Yorkshire and Lancashire, balanced on a shoestring and supported by faith, a small group of amateur astronomers are pursuing a dream.

It's called 'The Amateur Astronomy Centre'. The group are inspired by the astronomy centres of America and the 'star parties' they run; but the centre is peculiarly British in its ingenious use of whatever is available, its informal organisation and its dogged determination.

The whole enterprise is based on the vision of one man, Peter Drew, of Bedford Astronomical Supplies. His vision was of a centre where British amateur astronomers could come to use instruments of professional quality, far beyond the kind of equipment normally available outside the big observatories, and where the general public could come and learn about astronomy. The plan calls for a forty inch main instrument in a twenty-five foot dome in a permanent observatory, backed up by a thirty inch portable telescope and a range of smaller instruments. Peter spent the last part of 1982 finding out whether his idea would receive popular support from British amateurs. By the end of the year, he had decided that the answer was 'yes'.

Peter sold his house and car to raise the initial capital, and, at the end of '82, officially launched the Centre. He was joined early in the venture by the other directors of the centre, Rob Miller (of Astro Systems Ltd) and Linda Simonian (a graduate in Astronomy). Whilst Peter handles the technical side of the venture, Rob Miller is continuing to run the telescope business and Linda the administration of the AAC. Their support is vital and the three now work closely as a team. The site was an abandoned clay pipeworks in a valley beside the A681 road between Todmorden and Bacup, high enough in the hills, to be as free of stray light as anywhere in the Midlands. (Like all accessible places it has streetlights; but they are further down the hill and not obtrusive.)

Since it is in a valley it is also sheltered from the worst of the weather. The site is about five hectares and contained a vast amount of

rubble and broken pottery, and a derelict farmhouse that Peter intends to rebuild as his home. At present the only accommodation on site is caravans, two used by local astronomical societies and a pair used by the AAC as site office, shop and 'job centre'.

The initial capital paid for the site; but how was the centre to pay for the instruments and their mountings, and the day-to-day running of the centre?

There is a two-part answer to this: membership subscriptions and voluntary work.

Membership bargain

Membership of the centre is open to anyone, and is (by modern standards) unbelievably cheap – the centre offers 'founder membership' for a subscription of £2.50 a year. Once the centre is finished it will also offer 'ordinary membership', and the cost is likely to increase a little. For this modest amount, you get access to the site and (when complete) to the instruments, plus newsletters.

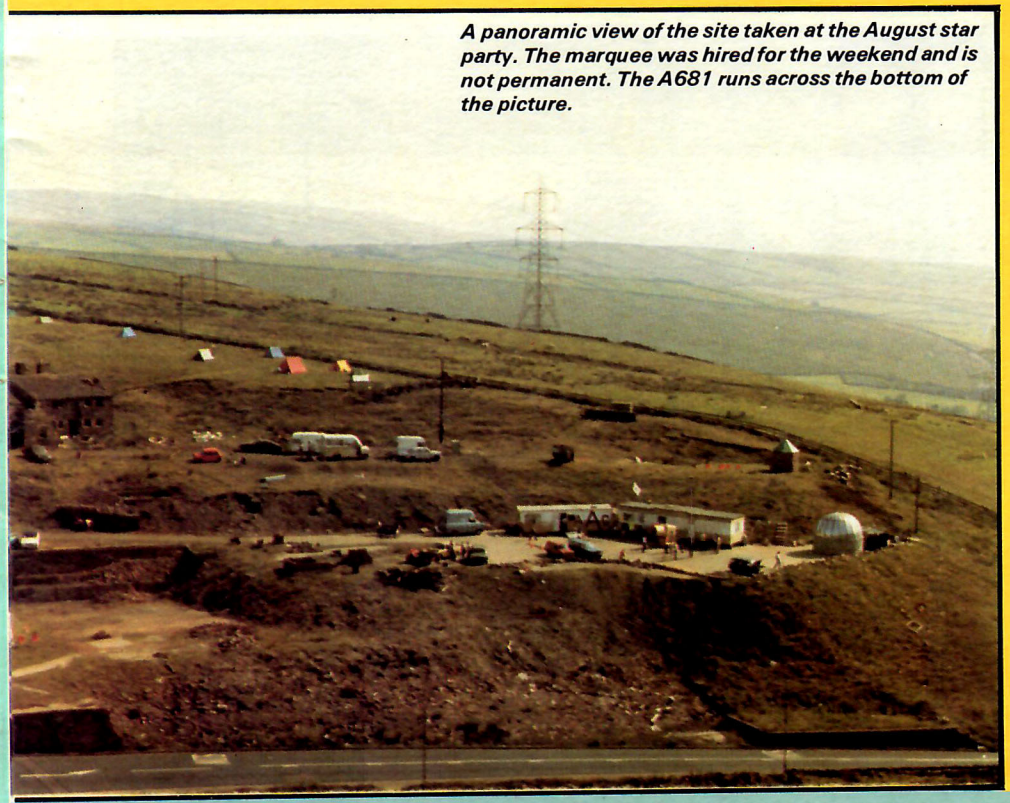
Because this sounds so attractive, a very large number of people have taken up membership including several well-known amateur and professional astronomers: amongst these are Patrick Moore, David Malin, Nigel Henbest, Heather Couper ... there were almost eighteen hundred members by the end of the 'star party' held at the site in December. In fact, so many people have joined that the directors have decided to limit founder membership to two thousand; so you'd better hurry and join if you wish to take advantage of the lower subscription rate!

The AAC now has almost half the number of members in the British Astronomical Association, the best-known organisation of British amateurs; for a rank outsider to get that far in two years is quite an achievement! It illustrates Peter's contention that the practical side of amateur astronomy has not been well served in Britain in the past, except by local societies with limited resources. Peter doesn't see the AAC as being in competition with the BAA and the Junior Astronomical Society, rather that they complement one another, with the BAA, in particular, acting as a theoretically biased society and the AAC providing practical support.

Peter Drew (in the AAC T-shirt) and Rob Miller discussing the incomplete frame of the thirty inch telescope at the August star party. **Photos: The Author.**

Volunteer Labour

The other way things get done for the Centre is by the members themselves. Clearing the site, making roads and paths and constructing the foundations of the observatory for the forty inch telescope are obvious places where amateurs could help, and members of Liverpool Astronomical Society (amongst others) did. Building the huts for the toilets (sorry, no main drainage!) just required woodworking skills and dedication; though both were much appreciated! Much the same may be said of the piped water supply laid on by members of the Boston astronomical society. But people with specialist skills have contributed in their own fields, for example, surveying the farmhouse to see how best to rebuild it, preparing the drawings of the observatory building for planning permission, putting together competent on-site wiring ready for the Yorkshire Electricity Board to come and connect it up, wrestling with the centre's infamous dump truck or building a high-resolution electronic imaging system for the large telescope.



A panoramic view of the site taken at the August star party. The marquee was hired for the weekend and is not permanent. The A681 runs across the bottom of the picture.

Equipment growing

The collection of instruments is growing. The tube framework of the forty inch telescope was displayed at the AAC 'Roadshow' at the BAA exhibition meeting last May and the foundations of the observatory are complete. The thirty inch reflector has been mounted in Dobsonian form which is in turn to be fitted to a trailer; the instrument was on display at the August star party, not quite complete, and would have been used at the December meeting if the weather had been kinder. The Centre also has a six inch Maksutov telescope and 120 mm (five inch) binoculars. There is a planetarium and a (home-made!) camera obscura of the highest standard (at the August star party we used it to observe the Moon in daylight, which is a pretty good test of this kind of instrument).

The planetarium was an example of the old rule that some people, by their enthusiasm and drive, make their own luck. Bradford University were disposing of a planetarium projector (a Goto E5) and the associated sixteen foot dome. The Centre expressed an interest, and acquired the instrument and its dome from the University for the princely sum of five hundred pounds!

As well as the centre's equipment, mem-

bers are beginning to install their own telescopes on the site. These instruments are also available for use by other members.

First of these is a ten inch Newtonian reflector on a German equatorial mounting, owned by Rosemary Naylor, secretary of the Federation of Astronomical Societies. Ms. Naylor's telescope is a solidly mounted instrument with excellent optics and a run-off shed on rails that, come to think of it, looks astonishingly like the struts of a caravan that blew to pieces last winter!

Next to be installed was Ray Brierley's sixteen inch reflector. This telescope won the home-made telescope competition at the August star party. It must be almost unique in instruments in its class: it has a cardboard tube (albeit pretty special cardboard!).

Educational aspects

As well as its facilities for amateur astronomers the Centre provides educational services. These are partly informal: people who 'drop in' can usually find someone willing to talk about the basics of astronomy and explain what the Centre is doing. Recently, the Centre has cooperated with the Pennine Heritage to entertain and educate parties of school children on a rather more formal basis. This is all in addition to the meetings for members and their guests.

Star parties

In August I was one of about three hundred people who made it to the site for the third star party. Some of these were members of the general public who happened to wonder 'what that cannon is doing up on the hill'. Others, like me, have small telescopes and just like to stand and stare at the sky in our spare time. There were members of the BAA there with some quite sophisticated instruments. Andy Hollis, of the minor planets section, even decked his car out as a display for his photoelectric photometry system! For the brave souls who stayed overnight there was accommodation in a marquee, or you could bring your own tent or caravan.

Although the atmosphere was informal and there were plenty of people to talk to there were also a number of organised activities, mostly on Saturday afternoon when the site was quite crowded with visitors. The events included a quiz, shows in the planetarium and camera obscura, a balloon race and a wheelbarrow race. (Not everyone realised it immediately, but the wheelbarrow race just happened to run up the hill from the pile of rubble to where the hard core was needed for the observatory!)

By evening a large crowd had arrived and set up about a dozen telescopes of varying levels of sophistication. An evening meal was served in the marquee and was followed by an informal report on the state of the centre from Peter Drew. The results of the competitions were announced, then the meeting was thrown open to discussion.

The December meeting, on the second anniversary of the forming of the centre, hardly qualified as a 'star party' since the hills were hidden by low clouds and very little was to be seen! This didn't deter the two hundred or so people who turned up! The organisers had planned for bad weather, however, and arranged a lot of 'indoor' activities in the marquee, and the planetarium was running. As usual, Peter Drew gave an opening address in the marquee to start things off. Subsequent events included talks on astronomical subjects, a quiz based on slides of deep-sky objects, a crossword (for which you needed some skill in astrophysical puns!), raffles, a caption competition based on photos of varying degrees of silliness taken around the site during the year and the usual competition for home-made telescopes.

Two major threats

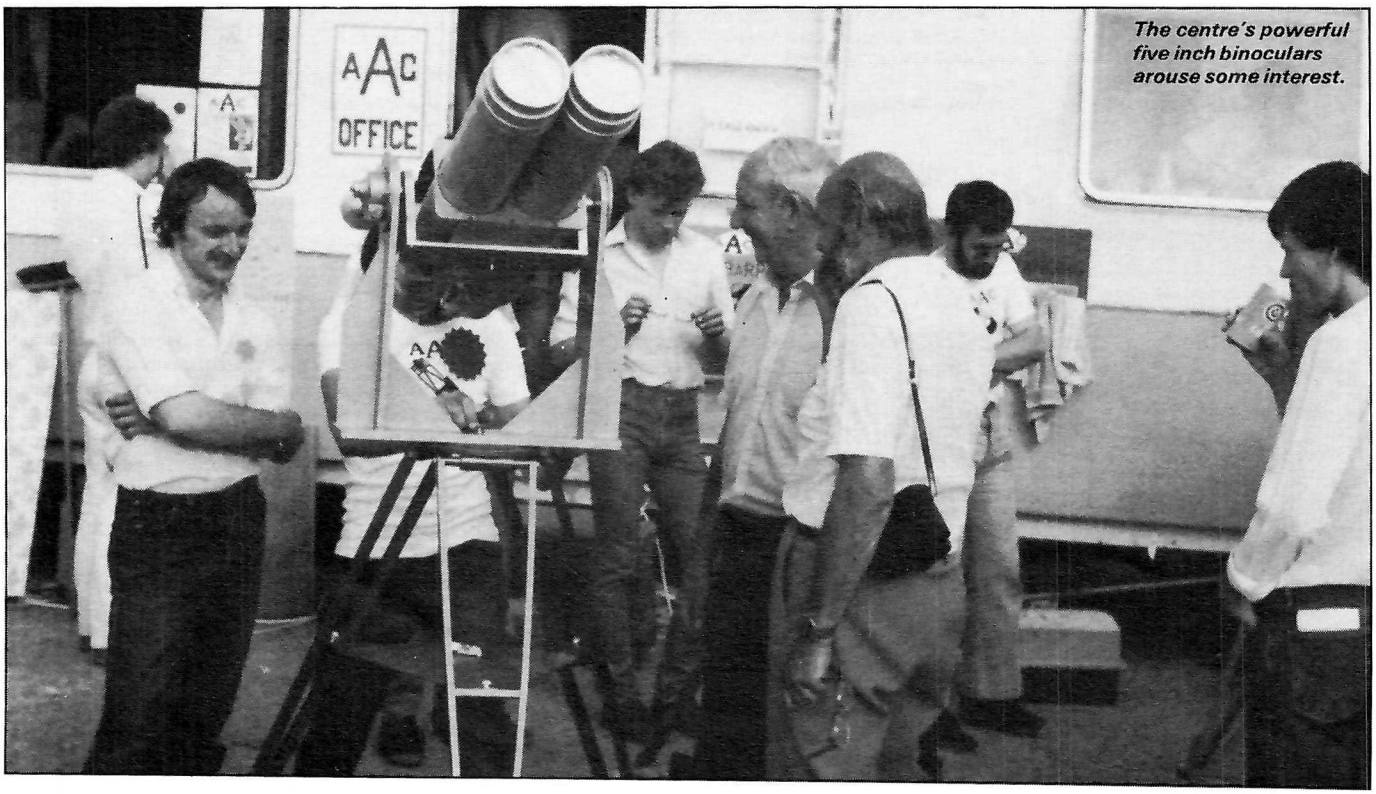
The centre seems subject to two major threats, its isolation and the perennial question of money. In fact, both are more apparent than real.

The centre is not as isolated as it seems. The M62 is just over the hill and visitors arriving at the local railway station can usually arrange to be fetched to the site. Even so, the slight difficulties of access to the site mean that the use of the instruments will have to be carefully planned and controlled if they are to realise their full potential. Serious programmes based on the large telescope will be very dependent upon the weather; it remains to be seen to what extent amateurs are prepared to make a possibly long trip which adverse conditions could render fruitless. The directors are optimistic (most of the astronomers we know would be quite happy to drive the length of the country to use such an instrument!) but it would be a pity if a telescope of this size was under-used because the people it is designed for are not prepared to make the effort to use it.

The 30 inch telescope should help. It is being made portable so that it can be taken to meetings intended for the general public, not just the astronomical literati. It should be a very effective way of bringing astronomy to the man in the street: it's one of the biggest portable telescopes in the world, if not the biggest.

With this kind of organisation people always worry about money. In fact, the Centre owns all its facilities outright, so only the operating costs have to be met, and these aren't very high. There is to be a fund-raising drive shortly to raise capital for the main building to house the forty inch telescope.

If you want to join, or would like more details, contact the Amateur Astronomy Centre at 111 Todmorden Road, Bacup, Lancs.



The centre's powerful five inch binoculars arouse some interest.

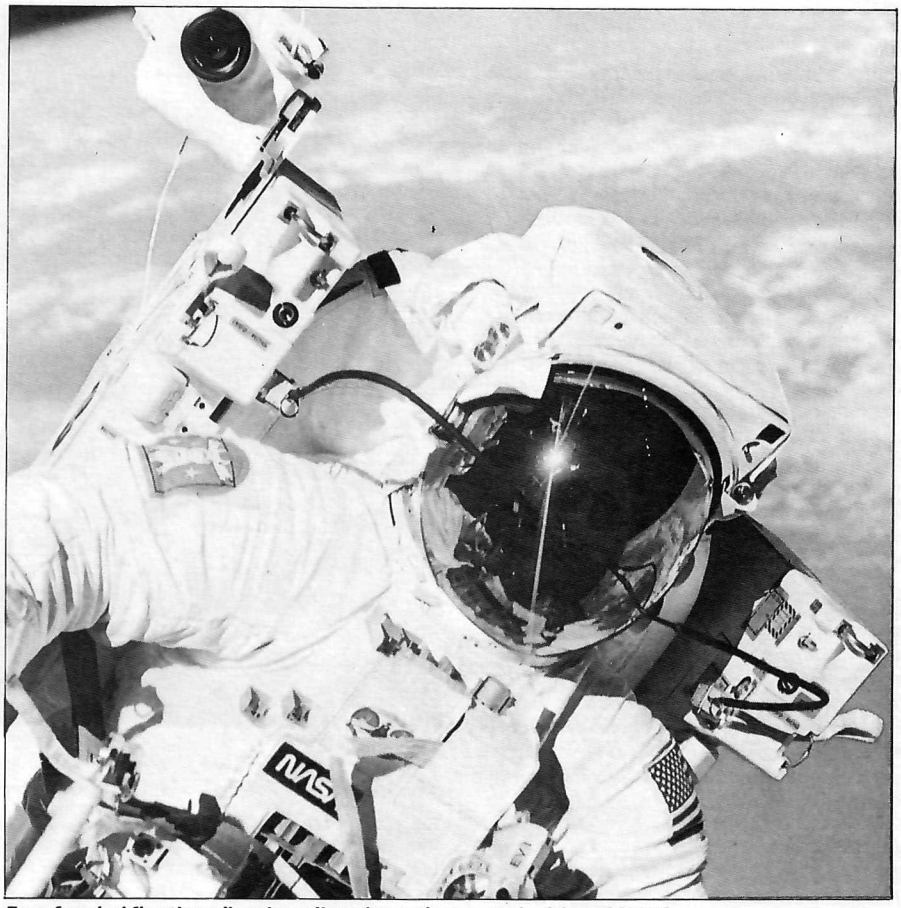
SPACE CAREERS

IN THE LAST PART OF HIS LOOK AT JOBS IN SPACE, ANDREW NIMMO EXPLAINS HOW WE CAN PERSUADE THE 'POWERS THAT BE' TO OPEN SPACE UP FOR LET.

Assuming there are opportunities for worthwhile work in space, and that you can prepare yourself to take advantage of them, how can you make sure that it all happens, that the necessary projects go ahead?

In the last two issues, we've looked at choice of projects, the Space Operations Centre (SOC), O'Neill's plan for Solar Power Satellites (SPSs), a possible space hotel in Low Earth Orbit (LEO), mini-SPS in geosynchronous orbit (Geo), laser-launched waverider shuttlecraft, forms and job qualifications for today's space jobs, fields in which jobs will arise tomorrow, space resources and space settlements in LEO and at the asteroids, and how to improve your own body and mind in order to improve your chances. None of this will be much use unless the kind of scenarios envisaged actually take place.

If we continue to leave the choice of projects to the scientists and politicians, things will continue to go on as at present. There will be lots of fabulous but unmanned scientific missions, and precious few of the manned kind we need to improve opportunities for space careers. We must, therefore, alter the balance of power over choice of projects, realising other potentials in addition to those at present being realised, if any improvement is to take place.



Ever fancied floating silently, miles above the ground with an MMU?

Potential Motives

Let's have another look at the motives listed in Part 1:

7) Freedom: The Minorities' motive. There are all sorts of small groups with unusual political and other ideas which they could try out, in some cases possibly to society's advantage, if they each had their own O'Neill type space habitat and freedom to govern their own affairs in their own way. Some of these are already able to influence politicians to some extent, by having members in position to do so.

6) Curiosity: The Scientists' motive – dealt with in Part 1.

5) Adventure: The Enthusiasts' motive. This probably includes you. In the US, the enthusiasts are banding together and exerting some power. Until that happens here, your prospects of getting into space will remain low. FS4 is willing to band together with others to this end. What about the BIS, ASTRA, the University Space Socs, and others? Do please write!

4) Profit: The Business motive. This doesn't necessarily mean shares and high finance. In a world full of unemployment a job is a profit. For this reason, Chris Darke, national organiser of the Technical, Administrative and Supervisory Section of the Amalgamated Union of Engineering Workers is already busy lobbying Geoffrey Pattie, Minister of State for Industry, who is responsible for space technology. Other unions should join in as the Chase Econometrics' 'Report on Space Economics' carried out in the seventies in the States, showed that for every job created in space work eight others are created in support industries.

The Space Shuttle has also interested commercial concerns in sponsoring some space research, but until Earth-to-orbit transport becomes cheaper, this won't take off properly. Only where costs of made-on-Earth products are greater than similar made-in-space products, or where advantages of made-in-space products cannot be equalled on Earth whereby people here are willing to pay the high costs of taking materials up, procesing them in space, and delivering them back to Earth, will the financial profit motive come into effect.

3) Defence: The Military motive. Until human settlements exist in space, whereby conflict between inhabitants of one with another, or of a settlement with an Earth-nation, seem likely, it is unlikely that military motivation will advance the cause of manned spaceflight. There is some opportunity here, but not much. Britain's first spaceman will be military for reasons of prestige, not defence.

The satellite which he will help to launch would be placed in Geo more economically by unmanned means.

2) Prestige: The Politicians' motive – dealt with in Part 1.

1) Companionship: The Public's motive. Like Defence, this is a motive which won't come into its own until settlements in space already exist. As soon as mothers have sons and daughters living permanently in space, the public will insist on regular transport to and from Earth. In many ways this is the strongest motive, for once established, it will ensure that the door to space remains open. That in turn will enable personal Solar System exploration to flourish, and will make your chances excellent. If your sense of adventure wants to take you to space therefore, there can be no more important project for you than the getting of that first space settlement established.

Lobbying

From this, it seems clear that enthusiast space societies, such as FS4; interested minorities, such as the Libertarian Alliance; trades unions, such as The Amalgamated Union of Engineering Workers; and businesses, such as British Aerospace, should get together to lobby jointly to bring about a situation where it will become more profitable for wider business interests to join us. Once major support is established, projects such as the space hotel/mini-SPS/laser-launched waverider scenario would follow almost automatically. This, in turn, would create favourable attitudes to the O'Neill plans, the hotel would grow, and we'd get our first settlement fairly soon. This means discrimination between space projects in favour of those which help to improve space economics. We must back those chosen to the hilt, lobby politicians, the media, industrial institutions, and others who should be helping us.

Because of the point I made in Part 1, about too many rival projects, we must also lobby against all other space projects. Money will always remain limited until the door to space is permanently open and space resources come into play. Once that first settlement is built, scientists can have all the unmanned probes they like, meanwhile I repeat, we must oppose these, unless they have potential economic advantage.

To avoid a plethora of projects, lobbying should be done carefully. It should be planned in unison with like-minded organisations. Otherwise, it can be dismissed as nuisance. Accordingly, let's get together first, then plan strategy. If you're not a member of a space society, join one, and if you are in a society, campaign within it for unison with others to a common end!

Lots of letters to one person, from lots of people, have best effect, but lots of letters to lots of people are a great deal better than none at all, so do join organised lobbies whenever possible, but don't wait for them to take place. Write, write, write, all the time! You can do this without making a nuisance of yourself by writing to many different people, rather than the same few over and over. Your TV and local radio stations, and newspapers [and *Space Voyager*! – Ed] all need feedback. Let them know when they print a good space item. A word of praise is worth ten thousand criticisms. It will encourage them to give you more. If you do criticise, always check your facts and be ready to quote an authority.

The crew of NASA's 41-D (Discovery) mission. Clockwise from top are: Judith Resnik and Steven Hawley, mission specialists; Michael Coats, pilot; Henry Hartsfield Jr, crew commander; Richard M (Mike) Mullane, mission specialist and Charles Walker, payload specialist.

If writing to your MP or MEP, mention that you live in their constituency. Do they attend 'All Party Space Committee' meetings? If not why not? Why don't you write right now and find out? If they don't attend and either don't reply or try to fob you off, write again and explain why you think they should go to the meetings. Always be courteous and honest.

Post-cards or one-page letters are best when lobbying. If you write a screed it'll be read by a junior clerk, if at all. They should always be addressed to a specific person, not just an organisation. They should be on one specific topic only and should give a reason the recipient can agree with. If you want to meet little green men in flying saucers, don't tell your MP, he doesn't want to know.

'Hansard' is what the record of who says what in Parliament is called. You can find out what your MP did or didn't say in a space debate there. Check it in your library.

Should you want to check a UN or other foreign space agreement, you should find it in *'Keesing's Contemporary Archives'*, which should also be available in good libraries.

Space Incentives

In the late '70s, Chris Basler, a New York lawyer, set up a company with the aim of raising funding for SPSs. International Satellite Industries Inc, (250 West 94th St, New York, NY 10025), says in its prospectus, 'The Company may give preference in its hiring of space workers to holders of its common stock.' Investing in this company might be another way you could get to space.

You need a fair amount of money to invest though, and a young Californian solved this by forming a small club for the purpose. Members contribute small regular amounts which are invested jointly on reaching the required amounts. For legal reasons, you can't join

Terry Savage's 'Space Investment Club', but if you write to him at 1900 Dufour 16, Redondo Beach, CA 90278, USA, enclosing some international postal reply coupons (obtainable from the post office), he'll send you details of how to form your own Space Investment Club. Check them through with your lawyer and bank manager, before doing so. UK laws will require some small changes in the scheme, but your banker will probably be particularly keen to help you.

The Space Settlers' Society, a society within FS4 which is free to join to FS4 members, has a scenario based on space resource retrieval with which it hopes to get all its members up to space, though it may take 20 years. It's too long to go into here, but an SAE to Chris Forrest, the FS4 Secretary, at the address in the FS4 ad in this issue, specifically asking for Space Settlers' info, will bring you full details.

There's also a possible paper transaction which might alter the whole scene. When nations print money without real wealth to back it, their currencies become devalued, but if the money printed was distributed world-wide, even if it technically devalued all currencies, as they'd all go down in concert, nobody would lose by it.

There would be no point in this, of course, as nobody would gain by it either, but space resources could be deemed to be real wealth to back a world share issue to real effect. Let us assume only 40% of asteroid material has worth and value this notionally at £1 per ton. The near-Earth asteroids are then worth £1 trillion, and the main belt asteroids, no less than 100 trillion pounds sterling. With masses of planets and satellites other than Earth which are accessible, we're talking of a really vast figure. Such a share issue would amount to a kind of world-wide distribution of futures, on a grand scale.

Now, the 'Agreement Governing The Activities Of States On The Moon And Other Celestial Bodies', or UN Moon Treaty, as it is more commonly called, says, 'The Moon and its natural resources are the common heritage of mankind . . . ' It prestates that the word 'Moon' means any celestial body, and this has been interpreted as meaning 'owned jointly by every individual on Earth', thus requiring legal agreement from everyone before anyone can use any space resource for any purpose. Because of this, FS4 in this country and the L5 Society in the States, among many others, have opposed the Treaty on the grounds that it kills incentive for space resource retrieval.

Move over Telecom

As Chairman of the Political Sub-Committee of FS4, I am naturally a supporter of such opposition, but there is another interpretation of the clause which may be advantageous. The Treaty calls for an 'International Regime' to administer space laws of this kind. If the International Monetary Fund, or some such body, were to be appointed to be this 'Regime', and if it then issued shares, as above, but according to a total notional value of say £5 trillion, sending the share certificates to the Governments of the world on behalf of their people, allocated according to the latest UN population statistics for the nations, a share of face-value £1,000 would be issued for each of the 5 billion people on Earth.

We know that even rock can be sold as shielding in space, oxygen as fuel, so the chance of only 40% having worth is small. Further, transactions are all likely to be at values greater than £1 a ton, and we're valuing the lot at a 20th of the known value of asteroids alone, so the real value of each share will be well over £20,000!

Stock-markets wouldn't value them that highly though, at least, not until the resources became accessible. However, if at the initial allocation, debtor nations were issued an amount of shares less their debt, and the shares given to those to whom the debt was owed, all calculated according to the chosen face-value, Third World debtor nations could be deemed to have repaid their debts in full. Those repaid in this way would initially lose by whatever amount the shares dropped, but they'd stand to make a fortune in time.

To work, this would require confidence in the future of space resource retrieval, or banks repaid this way might go bust, and if that happens, you and I lose our money also. If any nation or company wishing to exploit space resources had to first buy them from the Regime, at say 15p a ton of 40% of the mass of the body being bought, a third of which would have to be paid in advance in the form of returned shares to the required face-value, and if on full payment being made the buyer received full title to the body concerned, enough incentive might be created for this.

It would probably be sensible to make a further ruling that for bodies over half the mass of Ceres (the largest asteroid), it would be 40% of a fraction of the mass of the body, and rights would be granted to mine a proportionate fraction of the surface, up to an agreed maximum area per allocation. The rest could be kept as a reserve for use as the Regime saw fit, in the future interest of humanity.

Through time, this would ultimately bring the Regime at least £15 trillion in exchange for the £5 trillion face-valued pieces of apparently worthless paper originally issued, and that only counts known asteroids. There would be far more surface rights, and a host of newly discovered asteroids in reserve. Everyone on Earth would be vastly better off. Wealth is relative, however, so there would still be a few relatively poorer nations, which the Regime could use its profit to aid. Initially, though, the issue of £1,000 per head would be about enough to clear the largest Third World debt, and leave the nation a little over. If the initial value of shares was doubled, the biggest debtor nation would still have shares to the value of its previous debt, after paying the debt.

If share face value was initially doubled, a doubling of cost per ton to exploiters to 30p per ton, would keep our equation correct.

As I said, when placed on the market, such shares would drop, but there'd also be an effect on currencies. Present debtor nations, then out of debt, would find their currencies rising. Those currencies of major Western countries who had had debts repaid in shares would drop. But the wealthy nations would retain their present industrial capacities. They'd also know that all they had to do to make their currencies rise again would be to go get those space resources. Third World nations would suddenly find themselves able to afford many essentials and even luxuries hitherto beyond their reach. This one paper transaction would go a long way towards stopping starvation. In Third World nations, a million people a month die of this at present. There will always be some greedy thieves preventing its complete eradication, but there would certainly be major amelioration of the problems.

East-West tensions would also ease, as while Soviet currency changes would be minimal, with the West's currency dropping, like the Third World, the Soviets would be able to buy more. Their internal problems would ease, making them less aggressive. Western industries would suddenly have lots more customers, as people all over became more able to afford their products. This would bring back, if not full employment, certainly millions of new jobs.

Gold rock and Gilt shares

When a nation or company found a solid gold asteroid or whatever, that it wanted to mine, it'd have to go and buy the shares to pay the first third of the price to the IMF. This would cause the shares to rise again on the market. The more this happened the more they'd rise. Knowing this, some Third World nations might refuse to part with these shares to pay off debts, instead borrowing against them for the purpose, and hanging on so they could reap some of this benefit. Banks actually paid in shares would make far more than the interest of their original debts. Individuals may also gain directly, as some Governments might even issue the shares to their citizens.

Aware of all this, if such additional rules were announced, stock-market upheavals might not be as great when shares are initially placed as they would have been otherwise. The Third World would gain an enormous filip, space resource retrieval would become of paramount interest to wealthy nations, and nobody would lose anything much at all.

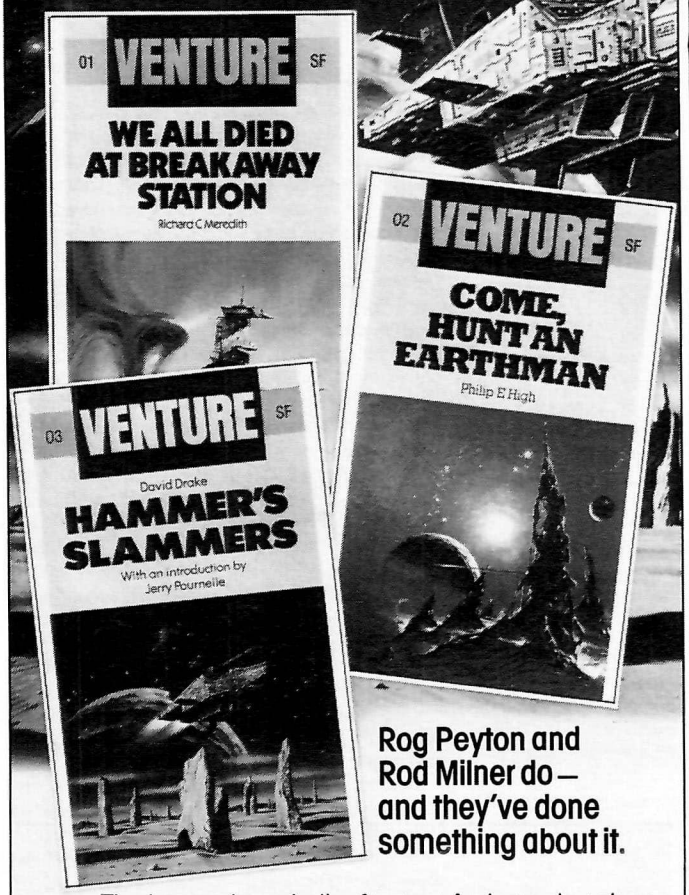
I am not an economist, so I may be wrong about all of this, but it seems to me that we could change the world for the cost of some printing. Any accountants or economists out there like to comment?

There is one sure gain that space can certainly provide, and that is hope. Hope is what the world lacks at present. Without it, even if we don't become extinct, life will get less and less worth living. But with it, no matter what our problems, we won't only survive but will enjoy our survival for hope brings anticipation, and anticipation makes anything worthwhile.

Nothing will happen if we sit and wait for it to do so. We have to make it happen. Consider the prospects in Part 1, with others you may think of yourself, decide where you might best fit in, choose a career from Part 2; make yourself as fit and intelligent as you can; if you're not yet a member of a space society, join one; join in organised space lobbies whenever you can, write to the media at every opportunity, write to politicians; earn money and invest it advantageously to manned space settlement; become a politician, journalist, radio, TV, or film producer and promote manned space settlement! Make it happen, or it won't.

If enough of us band together and work assiduously for the right projects, and if you do all these things, you'll get there. – Good Luck!

Do you remember when humans were heroes, androids didn't have social hang-ups and the only good alien was a dead one?



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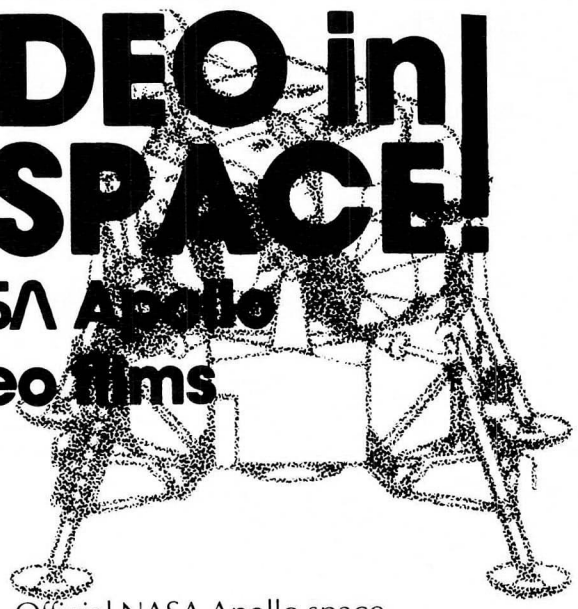

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Letter from Hollywood

RANDY AND JEAN-MARC LOFFICIER BRING A LONG-RANGE MOVIE FORECAST FOR THE SUMMER.

The summer is almost upon us and, with it, its plethora of genre pictures, most of which will be released in England during the fall or winter of 1985. This year is particularly rich, so hang on because, without further ado, here's an alphabetical list of The Wonderful Things To Come:

Baby: This Disney production stars William Katt (*The Greatest American Hero*) and Sean Young (*Bladerunner*) as a young couple who discover a dinosaur family in Africa. Lead villain is Patrick McGoohan (*The Prisoner*). US release: Spring.

Back to the Future: A Steven Spielberg production for Universal, directed by Robert Zemeckis (*Romancing the Stone*), and starring Michael J Fox (*Family Ties*) as a kid who takes a trip on a time machine. The key word here is 'kid'. You'll see it again. US release: Early summer.

The Black Cauldron: The new Disney animated epic, $25 million and 10 years in the making, is based on Lloyd Alexander's fantasy epics. John Hurt does the voice of the Horned King. US release: Early summer.

The Bride: This Columbia remake of *Bride of Frankenstein* was shot in France and England. Sting plays Baron Frankenstein and Jennifer Beals (*Flashdance*) the Bride.

Mel Gibson and friend as seen in Mad Max 2.

Directed by Frank Roddam (*Quadrophonia*). US release: Early summer.

Cat's Eye: Or rather, *Stephen King's Cat's Eye.* The title says it all: another King anthology á la *Creepshow,* starring Drew Barrymore (*Firestarter*). Directed by Lewis Teague (*Cujo*) for Dino DeLaurentiis and MGM/UA. US release: Early summer.

The Clan of the Cave Bear: Daryl Hannah (*Splash*) is a beautiful Cro-Magnon among Neanderthals. Based on Jean Auel's prehistoric saga, this one was written by John Sayles (*Brother from Another Planet*) for Warners. US release: Autumn.

Cocoon: Very good rumours about this Ron Howard (*Splash*) 20th Century Fox film which tells of the survivors of Atlantis and their effects on a group of old people. US release: Late summer.

Creator: Peter O'Toole recreates his long-dead wife, played by Mariel Hemingway, in this Universal picture. US Release: Spring.

Enemy Mine: One man and one alien fight it out on a lone planet in this 20th Century Fox film, directed by Wolfgang Petersen (*The Neverending Story*), and starring Dennis Quaid and Lou Gossett, Jr. US release: Christmas.

Explorers: Joe Dante (*Gremlins*) directs this Paramount picture about a bunch of kids (ah, hah!) who build a spaceship and go up in space to meet some aliens. US release: Late summer.

Fright Night: A Columbia film in which a . . . kid (yes!) believes his neighbour to be a vampire, and turns to a TV show host for help. US release: Late summer.

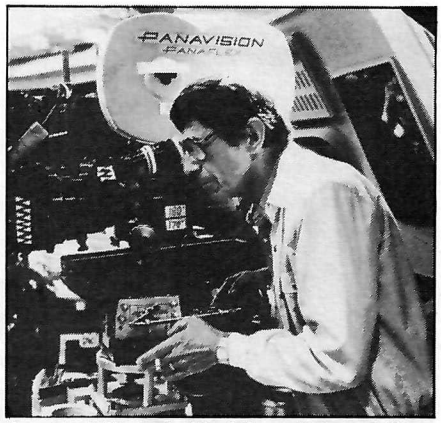
Goonies: Top secrecy still surrounds this Steven Spielberg production for Warners, directed by Richard Donner (*Superman*). All we know is that it's about a startling discovery made by a bunch of kids (what a surprise!), including Ke Huy Quan, from *Indiana Jones & The Temple of Doom.* US release: Early summer.

Jewel of the Nile: The sequel to *Romancing the Stone,* reuniting Michael Douglas and Kathleen Turner. Directed for 20th Century Fox by Lewis Teague, and shot in Nice and Morocco. US release: Christmas.

King Solomon's Mines: This Allan Quatermain thriller written by H Rider Haggard stars Richard Chamberlain in the title role. A Cannon film to be released for Christmas.

Ladyhawke: A medieval love story with a magic curse, starring Rutger Hauer (*Bladerunner*) and Michelle Pfieffer. There's also a cute kid, played by Matthew Broderick (*War Games*). Directed by Richard Donner for Warners. US release: Spring.

Legend: Ridley Scott (*Alien, Bladerunner*) directed this sword-and-sorcery saga with very special make-up effects by Rob Bottin (*The Thing*). Full of faeries and leprechauns.



Leonard Nimoy behind the camera on the set of Star Trek 3. **Photo: Paramount.**

You have to see it to believe it! Late summer release by Universal in the US and Fox in Europe.

Lifeforce: This adaptation of Colin Wilson's *Space Vampires* (the title says it all) is directed for Cannon by Tobe Hooper (*Poltergeist*). US release: Early summer.

Mad Max; Beyond Thunderdome: Third instalment in the George Miller saga of the future, starring Mel Gibson. This one has rock star Tina Turner as the Queen of the city of Bartertown where Max fights for his life in an arena called Thunderdome. Warners will release late summer in the US.

My Science Project: Another Disney project helmed by the man who wrote *Last Starfighter.* In this one, a bunch of kids, not to be confused with any other similar bunch of kids, find a way to explore other dimensions. US release: Late summer.

Red Sonja: The adventures of a female Conan in the world of Robert E Howard. Arnold is in this one, but not as Conan. Directed for Dino De Laurentiis by Richard Fleischer, who gave us *Conan the Destroyer.* US release: Early summer.

Return of the Living Dead: Has nothing to do with the upcoming Romero *Day of the Dead.* This one is written and directed by Dan O'Bannon (*Alien, Blue Thunder*). An Orion Autumn release.

Return to Oz: Dorothy goes back to Oz in this Disney sequel directed by Walter Murch, to help her friends fight the Nome King. Stars Nicol Williamson (*Excalibur*). US release: Early summer.

Santa Claus: The Movie: From the men who gave us the *Superman* films, this Christmas release (what else?) starring John Lithgow (*2010*) as the Man who Stole Christmas, and Dudley Moore as an elf.

The Stuff: Writer-director Larry Cohen (*It's Alive*) has come up with the Ice Cream That Eats People. It's a lot better than it sounds. A

New World Late summer release.

A View to a Kill: Roger Moore. James Bond. Christopher Walken (*The Dead Zone*), Grace Jones (*Conan the Destroyer*), John Glen at the helm. Who needs more? MGM/UA release for Early summer.

Weird Science: Guess what? Yet another bunch of kids creates a beautiful girl (model Kelly Le Brock). Perhaps they're finally tired of exploring time and space and are settling down to pursue more basic stuff. Universal release for Late summer.

Young Sherlock Holmes: Not strictly speaking a genre film, but a Steven Spielberg production (that accounts for it being listed here) for Paramount, directed by Barry Levinson (*The Natural*), to be released late summer. The theme is self-explanatory.

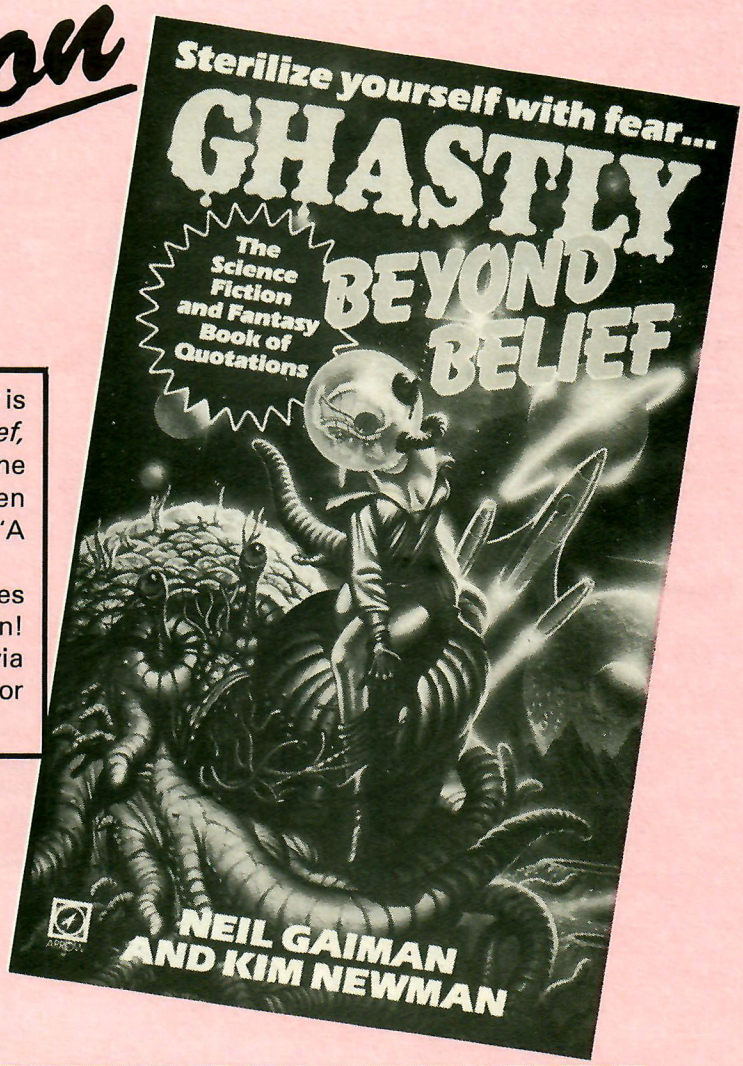
And this list does not even include the cheap horror pictures, some delayed foreign releases, and what-nots. Among the most interesting projects in production that might make it (but just barely) by the end of 1985, or more likely in 1986, are *Poltergeist II* (more kids, more ghosts), *Friday the 13th: A New Beginning* (more kids, more murders), *Stephen King's Silver Bullet* (more kids, more werewolves), *The Navigator* (more kids, more flying saucers), and *Radioactive Dreams* (kids again, this time fighting disco mutants). Fortunately, there's also *Star Trek IV* which includes NO KIDS AT ALL – yet! (They killed the last one in *Star Trek III,* remember?)

May the Force be with you. You'll need it.

Above, Rutger Hauer (the Replicant from 'Bladerunner') and Matthew ('Wargames') Broderick appear with feathered friend in Warner Brothers/20th Century Fox's production 'Ladyhawke'. Below, Wolfgang Muller (River Phoenix), Darren Woods (Jason Presson) and Ben Crandall (Ethan Hawke) – the three young stars of Paramount's 'Explorers'.

GHASTLY

Competition



This is your chance to win the book that the Editor is talking to everyone about! *Ghastly Beyond Belief,* by Neil Gaiman and Kim Newman, features the tackiest quotes from books and films and has been described by Harry Harrison (so Neil tells us) as 'A mind-boggling galaxy of guffaws.'

Arrow Books have very kindly given us 20 copies of the book to be used as prizes in this competition! Whether you're a film fan or a book fan, a trivia freak or a rabid fan, there's something in *Ghastly* for you.

All you need to do is send us your own favourite quotation from a science fiction/fantasy/horror film, book, story or comic. It can be funny, awful, brilliant or naff. Then say why you like it.

The best twenty we receive will each be awarded a copy of *Ghastly Beyond Belief.*

The competition will be judged by editor Wendy Graham and *Ghastly* co-author Neil Gaiman. Their decisions, no matter how bizarre, will be final.

Winners will be listed in *Space Voyager,* along with their selected quotes, and there's even a chance that your quotes might get into *Ghastly 2* (although Neil says he hasn't recovered from writing *Ghastly 1* yet, but pay no attention to him).

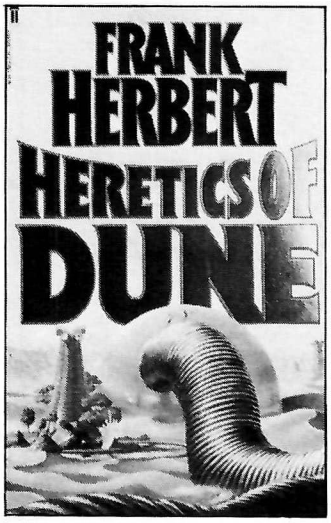
'Yes! I want to win my very own spanking new copy of *Ghastly Beyond Belief*! I have sent in my copy of my favourite quote and said why I like it (and I've remembered to say what film or book it comes from and who said it). I am over eighteen months of age.'

Rules

1. The competition will close on July 1, 1985.
2. Each entry must be accompanied by the entrant's name, address and the special coupon cut from this page. Each coupon covers only one entry.
3. Proof of posting will not be accepted as proof of receipt. Whilst every care will be taken, the publishers of *Space Voyager* cannot accept any responsibility for lost entries.
4. The competition is open to all residents of the United Kingdom. The staff of ASP Ltd and their relatives, and *Space Voyager's* printers, advertisers and contributors, are not elegible for entry.
5. The submission of a competition entry implies acceptance of those rules. The editor's decision is final and no correspondence will be entered into.

GHASTLY Clip Coupon

Readout



'Heretics of Dune' by Frank Herbert. Published by New English Library. Soft covers.

Dune continues! This time the focus is very much on the Bene Gesserit and their machinations on the planet Gamu. Highlighted is the progress through the sisterhood of a young Reverend Mother, one Darwi Oldrade, who, the book notes, has already borne an astounding 19 children for the sisterhood as the book opens, and each by a different father . . .

Dune/Arrakis is also featured. Now a much changed planet, it is destined to go through more metamorphoses before the whole saga closes.

Duncan ghola's are still in production and power struggles continue much as before.

In other words, *Heretics* is the latest tome in the series. Opinion – if you liked the others you'll like this too – odds on that you've either got hooked on the weight of words, or given up, or ignored the whole thing.

WG

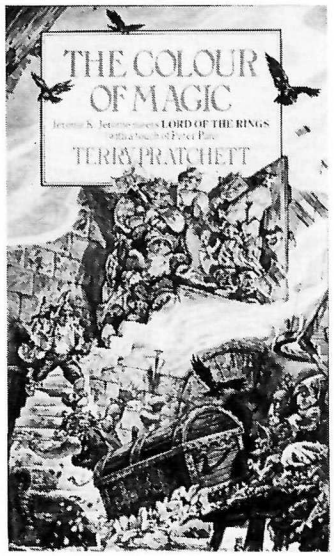
'The Colour of Magic' by Terry Pratchett, published by Corgi at £1.75. Soft covers.

Create a universe where the world on which you set your story is an earth disk which balances on four giant elephants which in turn are riding on the back of a giant turtle (sex unknown) and people that world with three main characters and lots of eighth colour (octarine) magic and you have the beginnings of the idea of the inventiveness of this book.

The publisher bills it as 'the wackiest and most original fantasy since *Hitchhikers Guide to the Galaxy* and while I'm not sure about that, I do feel that traveller Twoflower out-cools Zaphod and Ford, while the other central character is Rincewind, a failed magician who only knows one of the eight great spells – which he can't use.

The whole book is filled with the most outrageous puns and plot, and it looks as though a sequel may be planned since the end of the story is left fairly open.

I certainly wouldn't use the wordy wacky to describe this book, but it is written in a similar vein to *Hitchhikers,* and could take off in the same way. **WG**



'The Survivors' (Dinosaur Planet II) by Anne McCaffrey. Published by Orbit at £1.95. Soft covers.

This is the sequel to Anne's 1978 book, *Dinosaur Planet* and tells of what happened to the survivors of the title after they revive from their long hibernation after the mutiny.

As with any McCaffrey universe there is plenty of imagination here, backed with careful thought on the workings of that universe, so that there is never a false note on the background to the story. One of the things about her style is that Ms McCaffrey creates all these strange beings, and you can't get much stranger than sentient, if ponderous, (but very smart) rocks, and then brings them into the story as if they were the most familiar thing in the world – as indeed they are, in that world.

Since these two books are published by a different publisher it is possible that some McCaffrey fans haven't come across them, which is a pity, for while I don't think they rank with the *Dragon* series, or the Crystal Singer, they are certainly well worth a place on the shelves of any SF fan. **WG**

'The Nomad of Time' by Michael Moorcock. A collection of three books 'The War Lord of the Air'. 'The Land Leviathan' and 'The Steel Tsar', published by Granada at £2.95. Soft covers.

The first thing which must be written about this collection is that, as with any such, it represents very good value for money, with three books available for under the probable price for two, so that for those wanting to expand their book collections with good examples of works by well-known authors collections such as this are high spots.

Moorcock's first book of the trilogy was published as long ago as 1971, with the second following in '74 and the third in 1981, so many young readers may have missed them first time round.

The construction of the book reminded me somewhat of H Rider Haggard in that the three stories are recounted as narratives related to Moorcock, by Bastable, the central figure.

Oswald Bastable, and certain other characters are Chrononauts, blessed – or cursed – with the ability to travel through time, and through time-streams. **WG**

'Shuttle' by Nigel MacKnight. Published by MacKnight International at £4.50. Soft covers.

By the time you read this, Shuttle will have been on the bookshelves for about a year. Written and published by Nigel MacKnight, this book traces the development of the shuttle from the M2-F1 manned lifting body of 1963 to the speculated designs and programmes of the future.

The format of the book is almost like that of a heavy-duty magazine, but it is worth every penny of the cover price to a discerning shuttle-nut. The photographic content is excellent – coming from Boeing, Martin Marietta Aeropace, Rockwell, the US Army and, of course, NASA – and features many rare views of the shuttle, derivatives, personalities and equipment.

There are interviews with two astronauts – Robert Crippen and Mary Cleare, and a chapter describing life aboard the shuttle – including a typical menu and instruction on how to use the toilet facilities!

Astronaut training is discussed in some detail, as is the construction of the shuttle, the extra equipment such as the MMU, and the various transportation devices used to ferry the shuttle's 67 ton bulk.

A further bonus at the back of the book is a removable poster. This unfolds to approximately 33 × 23 in and has a dramatic view of a shuttle launch on one side and a scaled down plan of the flight deck on the other.

At the quoted price we can thoroughly recommend this book to any *Space Voyager* reader wishing to learn more about one of the great space technology advances of our time.

CR

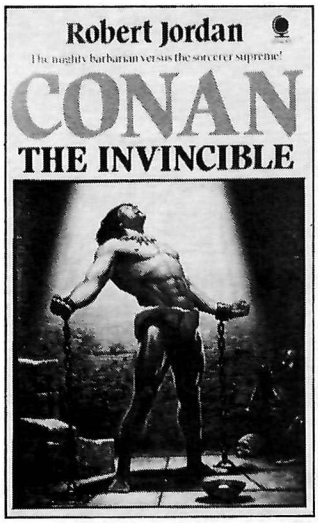
'Neuromancer' by William Gibson. Ace. $2.95. Published by Gollancz, £8.95, hardback.

Too much sf seems extrapolated from a future that was already out-of-date in the 1950s. *Neuromancer* is nothing of the kind: based about a century in our future it concerns Case, an interface computer cowboy. He doublecrossed the wrong people, and was rendered unable to interface with a computer matrix. Now a mysterious stranger has offered him a cure in exchange for a job. It's all highly illegal, and we are moving in a shadow-world of the future, of big business and new crime, new technology.

It's densely written, with echoes of Bester and Delany. Visual, realistic and likely: this ought to be a major Hugo and Nebula contender. It also heralds a remarkably impressive new talent. Robert Silverberg describes it as a 'high tech punk novel'. It's that, and it's also one of the only books I've read recently

to give me hope that there may be a future for sf that isn't recycled pulp trilogies; we *need* sf to help us cope with the rollercoaster-ride into the future we're all travelling. And (apart from being exciting, poetic and a helluva lot of fun) this helps.

NG



'Conan the Invincible' by Robert Jordan. Published by Sphere at £1.75. Soft covers.

For fear of this book being condemned from a purely feminist point of view, I took it to my pile of books to be reviewed. Unfortunately, it is hard to ignore the 'macho' slant.

Throughout the book there is only one woman, portrayed as rather an arrogant fool, who refuses to behave like a servile vegetable, I can't recall a single passage in which any woman is decently dressed.

It is a shame that this should be the case, for Robert Jordan is a talented writer, certainly above this sort of thing, but it sells. Indeed, it is Jordan's skill which just manages to save this book from itself – though to read the prologue you would never know – as his technique is intelligent and he manages to make the plot just thick enough, coupled with plenty of action, to hold the reader's interest.

Although not really my preferred reading matter, the Conan books are very popular, and make for reasonable fantasy escapism. One thing puzzled me, however. This is the 21st book in the series – keeping just ahead of the *'Gor'* collection – yet Conan himself is said to be not yet nineteen! **CR**

'Stonehenge: Where Atlantis Died' by Harry Harrison and Leon Stoveer. Published by Granada at £1.95. Soft Covers.

This book is sub-titled **'The Mighty Saga of Atlantis and Ancient Britain'** and a postscript tells us that the background is authentic. There is certainly plenty of fighting.

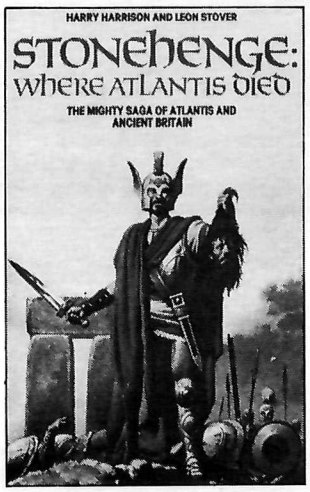
There is a bloody massacre in the first few pages which is a good or a bad thing, depending on your outlook, and the battles carry on from there, with Egyptians, Druids, Atlanteans, Myceneans and all sorts wandering round ancient Brit.

Maybe it is me, I didn't like this tale. Perhaps it is because the hero is so thick, all sword and surviving practically having his head chopped off.

Neither could I believe in the authors' extrapolations of what life was like for those ancients. I mean, is it likely that Stonehenge was built by an Egyptian in exile to give bigger clout to a rather thick Mycenean who wanted to be chief over all the British tribes, the idea being that each tribal chief had his wood-and-whitewash version where he sat and chiefed.

No, sorry, another one which didn't grip me.

WG



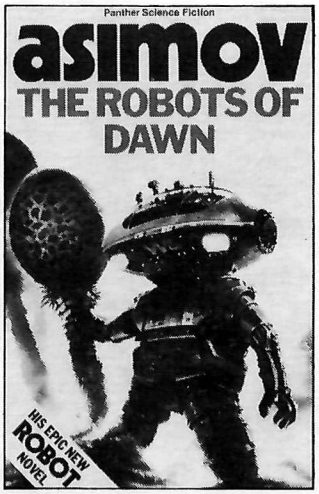
'The Robots of Dawn' by Isaac Asimov. Published by Granada at £2.50. Soft Covers.

Hurray. A super book and highly recommended. After a crop of put-downables here is one you'll want to read straight through.

At his worst Asimov is entertaining with fiction and at his best he is one of my favourite authors. I would rank this as one of his best yet.

Not only does it feature robots – and of course the complexities of Asimov's own Three Laws – but at the end it even links forward to his Foundation series.

The story itself is – basically and baldly – a 'whodunnit' with the solving of a mystery as complex and tangled as any of Agatha Christie's, but there are many layers of examination of behaviour, culture, relationships and motive interwoven.



The whole story covers ony 50 hours, has few characters, is 477 pages long, yet in that time one is never bored – or lost or confused (apart from, of course, confused about the solution to the mystery! And on that I never felt tempted to flip to the end to find out the solution either!).

Dr Asimov, as far as I'm concerned, you can take a bow for this one.

WG

'The Female Man' by Joanna Russ. Published by The Women's Press at £1.95. Soft Covers.

This is one of the first books to be published under a new imprint – 'Women's Press', and so is to be greeted with at least muted applause, if not three hearty cheers.

But I didn't like it. The back cover notes tell us that Joanna Russ is a Nebula and Hugo award winner, but I thought this effort pretentious and incomprehensible.

A few years ago peculiar chaptering of books was all the vogue – happily it has all but died out, to the joy of both readers and typesetters alike, but this book has as Chapter 16 of part one – and we're only on page 18 here – 'And here we are'.

Well, I'm glad someone knew where they were, because I didn't.

The story, so far as I could make out from what I managed to penetrate, concerns other universes parallel to this earth, worlds without men and people changing sex – just like that.

But I was never really sure what was going on.

I don't mind a book which makes you work – in fact I welcome one, but I do not like a book which has me totally lost on page one – a fault it seems of many of the books being published just now – or perhaps I' going through a thick phase (check the rest of *Space Voyager* for comprehensibility).

Authors can make their readers work, fine, but not to the point of having to read every word six times and then read through the preceding ten paragraphs of the first page. **WG**

'Bloodhype, and Outerworld Adventure' by Alan Dean Foster. Published by New English Library at £1.75. Soft Covers.

Another from the prolific pen of Mr Foster, and not a movie novelisation! But for all that it is fairly predictable, being a sort of detective/battling alien baddie sort of story, in which I guessed the finale after a very few pages.

It is one of a series based on Foster's own universe of the Commonwealth of Thranx and while followers of that series might be able to keep track of all the alien life-forms I lost my bearings several times on who was what.

Generally a run-of-the-mill sort of SF adventure story. **WG**

'Passengers' by Michael J Lawrence and Thomas G Foxworth. Published by Granada at £2.50. Soft covers.

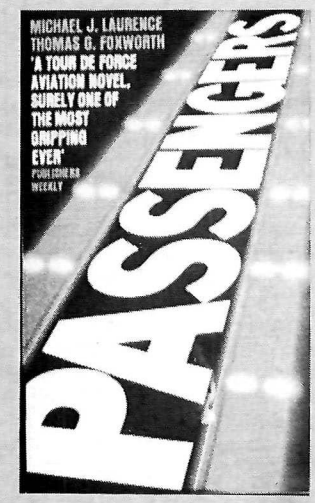
This is one of those bad-big-business versus lone-human-who-knows-the-truth jobs and I'm afraid I couldn't get very excited about it.

The story is about a super-super sort of Concorde passenger aircraft which has a DESIGN FLAW. The plane-makers and the airline don't want to know about a widget/insect (it's more than a bug) in the fly-by-wire system and throughout the novel are more worried about money than planes which might crash.

One big credibility gap in the book is that fly-by-wire isn't even the state-of-the-art technology for planes any more – they're already flying around – the boffins at British Aerospace tell me that the next step, on which they're working now is fly-by-light ... optical fibres to carry instructions

Readout

around the planes – so that the basic premise of the book is half way obsolete anyway.


MICHAEL J. LAURENCE
THOMAS G. FOXWORTH
'A TOUR DE FORCE AVIATION NOVEL, SURELY ONE OF THE MOST GRIPPING EVER'
PUBLISHERS WEEKLY
PASSENGERS

Not only that but the characters are pretty stereotyped and boring. Not only couldn't I believe in planemakers acting the way they did – I've known quite a few, though these are American planemakers and perhaps they are as conscienceless as made out, though I very much doubt it, but all the characters are plain dull.

I dutifully ploughed through the book but didn't really care what happened to anyone or anything. It isn't always easy being a reviewer.

WG

'Cugel's Saga' by Jack Vance. Published by Baen Books at $3.50. Soft covers.

At the end of *The Eyes of The Overworld* Cugel the Clever, having made his way across the Dying Earth to take his revenge on Iucounu, the Laughing Magician, found himself transported once more across the aging planet, with the entire, impossible journey to attempt once again. *Cugel's Saga* is the story of his travels and travails, told in thirteen elegant and amusing short stories. As the red sun flickers overhead Cugel once more cheats and is cheated, wrenches, fights, runs away, and escapes certain death by the skin of his teeth, all the time travelling South to Almery to take his revenge on Iucounu. Each story is a gem, perfectly crafted, containing the cultures, people, names and places, unlikely monsters and unlikelier magic that readers have come to expect of Vance. If anything, it is funnier and wittier than its predecessor; poor Cugel is never quite as clever as he believes himself to be, and his experiences with the Bagful of Dreams, Madame Soldinck and her daughters, and with that curious scale known as the 'Pectoral Sky-break Spatterlight' are a joy to read and reread. fabulous stuff. **NG**

'The New Fantasy Illustrator', published by New Media Publishing, of Florida. $9.95.

Much of this has been written by John Peel, Editor of *Fantasy Empire* and sometime *Space Voyager* contributor (*V* in issue 12).

Artists covered in this first of what I hope will be many monthly issues are Tim and Rita Hildebrandt and Barclay Shaw, plus an interview with art director James Frenkel.

The whole is printed on very high quality paper in full colour, which is why the price seems a bit steep for a magazine, but it is worth it, with each illustration well reproduced full page so if you wanted they could easily be removed and framed.

Many *Space Voyager* readers are interested in the artistic side of things, and for them I recommend this publication without reservations.

WG

'Extra(ordinary) People'. Joanna Russ. Published by The Women's Press at £1.95. Soft Covers.

This is the second Joanna Russ to go out under the new imprint, and I must admit I liked these short stories a little more. The artificiality and gimmick of silly chaptering was gone, so that they became more readable and less disjointed.

That being so, there are still unnamed people speaking in italics popping up at times and one is still left floundering, so I am forced to the conclusion that reader confusion is Ms Russ's style. I can't say I really like it.

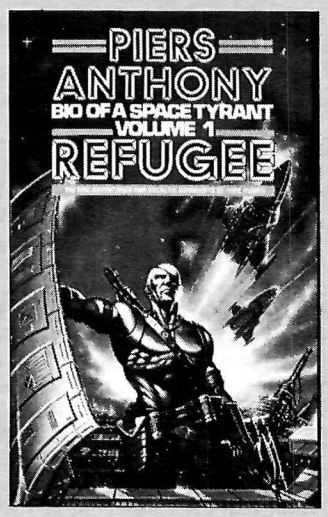
WG

'Bio of a Space Tyrant, Volume 1: Refugee.' Piers Anthony. Granada. £1.95.

In which fifteen-year-old Hope Hubris flees with his parents and two sisters from the repressive regime of Callisto to sanctuary (they hope) on Jupiter.

On the way, however, the illegal space bubble in which they are travelling gets attacked by pirates oodles of times and everybody else gets killed except his sisters who are both taken as slaves by different sets of pirates.

And the book is . . . well, let me put it another way. If anybody had ever told me that a fairly competent author could make cannibalism, incest, piracy, transvestism, piracy, sex, murder, piracy, smuggling, revenge, rape, slavery, piracy, drugs, more rape and more piracy into a mind-numbingly boring story I would never have believed them.



This is it. Mind-numbingly boring; this is the kind of stuff that burns out brains. Once on a time Piers Anthony wrote one of my all-time favourite funny sf books, *Porostho Plus*, the adventures of a space-faring dentist, and he has a good line in pun-filled popcorn fantasy with the Xanth series. But he's also written a lot of dreck. The prologue to *Refugee* states that we have another four of these empty B.o.a.S.T. books to come. Someone else is welcome to review them; I won't be reading them.

NG

'The Image of the Beast'. Philip Jose Farmer. Granada. £1.95.

'WARNING' reads the cover, 'This modern classic of horror fantasy contains scenes that may shock the nervous'. Heh! heh! heh! In the first chapter Herald Childe, private eye, watches a blue home movie in which his ex-partner is first seduced by a lady with metal dentures, then dies (coming and going?) as she chews up his reproductive organs. Everything else is pretty tame: Herald follows the trail to an LA castle, where he is imprisoned and forced to indulge in connubial whatsits with a were-snake, were-wolves, a were-pig (sow) and other weirdities, finally getting freed when he succeeds in laying an extremely attractive one-hundred-year-old lady ghost. The plot is formless, the detection stinks, the horror isn't and I've seen better erotica on the walls of a bus shelter, but the book as a whole has a certain sleazy claustraphobia that kept me reading. I think I may have enjoyed it.

NG

'Melvaig's Vision' by Richard Ford. Published by Granada at £2.50. Soft Covers.

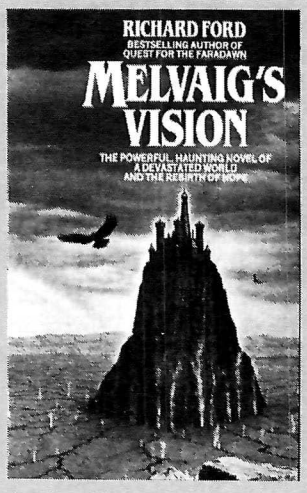
Well, I don't know about his vision, but he seemed terribly thick to me. Melvaig is this post-haulocaust Earth inhabitant whose woman gets nicked by some rampaging heavies and he sets off to find her, accompanied by their kid, who whines all the time.

In fact this kid is such a pain that he nearly dies in the desert from lack of water due to his having cried all the time. I longed to give him a clout round the ear and tell him to shut up.

It is all pretty turgid prose – example 'on and on went his tortured spirit, lurching from one emotion to another, endlessly, like a great wheel'. And that quote, I promise was taken at random as the first sentence I saw when I opened the book. Heavvvvvy.

Don't bother unless you've got a wobbly table and this book is just the right size to prop it up.

WG


RICHARD FORD
BESTSELLING AUTHOR OF QUEST FOR THE FARADAWN
MELVAIG'S VISION
THE POWERFUL, HAUNTING NOVEL OF A DEVASTATED WORLD AND THE REBIRTH OF HOPE

Reviewers this issue:
NG Neil Gaiman
WG Wendy Graham
CR Chris Richmond

Products

Greatest Science Fiction Hits Volume 2. Neil Norman. PRT Records NCP 702.

Before getting down to business, it may be a good idea to settle the confusion surrounding Neil Norman's trilogy of sf theme albums. The American company, Crescendo Records, have released three volumes of music from this talented young musician (the first two volumes were reviewed by Mat Irvine in *Space Voyager* No 5). However the British recording company, Precision Records & Tapes Ltd, have also released their own two-volume set under the same generic title: the first PRT volume contains a selection of themes from the first two Crescendo albums, while the second is identical in content to the third Crescendo volume. Confusing, I agree, but worth knowing – mainly because the UK recordings are nearly half the cost of the US albums. The price varies enormously depending on where you decide to purchase, so it may be worth shopping around – they're pretty widely available.

As Mat Irvine has previously pointed out, Neil Norman's main weakness is that many of his tracks tend to be very short – this is certainly evident here, as there are *nine* tracks on each side; some of them, I'm sorry to say, are very short indeed (Dominic Frontiere's evocative theme from *The Invaders* lasts a ridiculous thirty-seven seconds – but it's good while it lasts). Lack of space prohibits an in-depth analysis of each and every track, but high spots include John Williams' themes from *Land Of The Giants, Lost In Space* (both seasons!), *Raiders Of The Lost Ark* and *Return Of The Jedi,* plus *Space: 1999* (Derek Wadsworth's theme from the second season), *The Thing, Blade Runner, Capricorn I, The Invaders, UFO* (composed, of course, by the late great Barry Gray), *Vena's Dance* (from the *Star Trek* episode *The Menagerie*) and *War Of The Worlds* (a great track, this, featuring the whirring of the Martian war machines as well as a brief burst of Leith Stevens' title theme).

As with any album of this kind, there are also the less noteworthy tracks – *Angry Red Planet,* a particularly awful arrangement of the theme from *E.T., Flash Gordon* (yawn), *Voyage To The Prehistoric Planet* and *Into The Alternate Universe.* A special word of scorn, incidentally, for Neil Norman's treatment of the late Ron Grainer's theme from *The Prisoner* – which could have been the best track on the entire album but instead comes across as sounding rather rushed and lacking that driving, ominous atmosphere that helped to make the original version so memorable. The percussion on this track is no help at all – it doesn't have that authentic sixties feel. I've a sneaking suspicion that Norman doesn't really understand what makes Ron Grainer's music tick – witness his treatment of the theme from *Doctor Who* on a previous *Greatest Hits* album. It should be pointed out, by the way, that this particular version of *The Prisoner's* music is *not* the opening title theme, but the less complex arrangement used in the end titles of the show.

For all its faults, however, this is a terrific album – of particular interest to the growing number of sf/film/TV nostalgia buffs who still get that tingle down the spine whenever they hear the familiar strains of some classic theme from the past. This is apparently the last of Neil Norman's trilogy of 'theme' albums, so you'd better make the most of it.

GW

'The Search for Spock' CIC Video. Running Time about 100 minutes.

Isn't it nice how quickly films come out on Video these days. We can see them once or maybe twice at the cinema, and then after a pause in which they can mellow in memory, we can see them at home again.

And of course the advantage of watching a video at home is that one can pause to reflect, or to take note of what was missed at the cinema, and appreciate the good bits.

That's what happened with me on re-watching *Search for Spock.* I enjoyed anew the touches like McCoy's attempt at neck-pinching in the bar-room scene – plus the tribbles, and got annoyed over the whole basis of the second half of the film.

Maturing memory makes me realise what a hole there is in the plot. Way-back-when in the series we learned that Spock comes from an important family – Sarek and T'Pau carry a lot of clout, so why on earth – or Vulcan – didn't either of them just go to the Federation Council and ask for Spock's body to be retrieved. End of that problem. Saved Enterprise.

The destruction of the Enterprise annoys me still in many ways. It annoys me because it still moves me and it is only a ship and not even a real one at that, not a living being, and because it is unnecessary to the story that it should happen and that it did happen (who're we going to kill in the next film?)

But the good news is that at the beginning of the tape there is a plug for *Stark Trek IV,* tagged 'The best is yet to come'.

Quality of my copy was good, though true Trekkers would watch through a thunderstorm!

WG

Terrahawks official Blueprints – Engale Marketing, 13 Primrose Avenue, South Shore, Blackpool, Lancashire. £5.45 incl P and P.

A must for modellers and Gerry Anderson fans these. Engale Marketing is another facet of our own writer David Nightingale, who has been compiling the Gerry Anderson series which so many of you have been enjoying.

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craft, and small size colour pic of same.

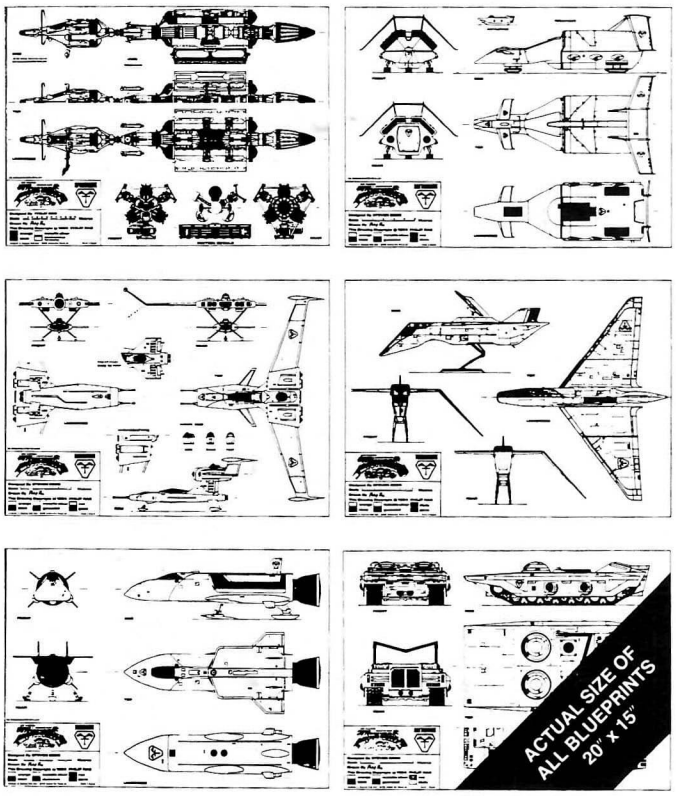
Each of the blueprints has been drawn to scale by Philip Rae and shows a wealth of detail of all external elevations of each craft. The blueprints were designed by Steven Begg.

Each blueprint is also colour and material coded to assist in the finishing of the model.

While some folk might think that Terrahawks hasn't been the greatest Gerry Anderson series, the model work was up to his usual high standard in terms of design and excitement, so I would imagine that many of you modellers out there will jump at the chance of scratchbuilding from accurate scale blueprints. These are well designed and are produced on high quality paper with excellent reproduction.

Let us know if you use them to build something!

WG



The Tripods – Theme from the BBC TV series. Composed and Produced by Ken Freeman. 7" single. BBC Records RESL 158. £1.65.

BBC Enterprises are a funny bunch when it comes to releasing music from TV series. They can – and often do – devote several hours' worth of listening time to the latest assortments of high-tech bleeps and gurglings from the Radiophonic Workshop, and release compilation albums featuring music from mini-series such as *The Master Of The Game* and *The Thorn Birds* – yet there are still some remarkable themes and scores which have yet to find their way onto the turntables of soundtrack enthusiasts. Where, for example, is George Fenton's music for *Bergerac,* or Dave Greenslade's scores from *Bird Of Prey* and *A Family Man*?

After all this, it comes as a pleasant surprise to see that the Beeb have decided to release Ken Freeman's superb music from *The Tripods* as a single. It's an extremely exciting piece of electronic wizardry, conveying a strong sense of menace – yet, to some extent, it doesn't really work in the context of the series. If you find this comment puzzling, consider for a moment the basic concept of the programme (neatly explained, incidentally, on the picture sleeve): 'The year is 2089 – but the style of life on Earth(sic) is more reminiscent of 1789. There are no great cities now; people live in small country villages where the pace of everyday life is determined by the only means of power – the horse . . .'

Precisely. Here is a series which cannot exactly be described as fast-paced, yet the theme music is of such epic proportions that it promises much more than the programme actually delivers. But as I've said, it's stirring stuff. When the music develops beyond the limits of the theme heard on the show's opening titles, the percussion hots up and the whole thing turns into a bizarre disco version: this is something which I would usually abhor, but here it works quite beautifully. The middle section is one of those up-and-down, rollercoaster affairs but Freeman re-introduces the theme very skilfully and puts things back on course.

Side Two contains the series' Closing Theme – a complete change of mood for this one, which sounds like the kind of music one might expect to hear if Vangelis were to compose a soundtrack for a documentary about Winston Churchill. But even so, it's still much better than anything being produced by the boffins of the BBC Radiophonic Workshop, who seem to be so preoccupied with blowing into empty milk bottles and scraping housebricks together that they've forgotten how to write music. Maybe Ken Freeman could be persuaded to compose some music for the next season of *Doctor Who* . . . ? Well, it's just a thought . . .

GW

Golden Heroes. Games Workshop. Boxed Rôle Playing Game. £8.95.

Golden Heroes is Britain's first major contribution to the rôle playing world which in the past has been completely dominated by the Americans.

The game consists of a players' guide, a supervisor's handbook and five good quality dice (2D10 and 3D6).

The players' guide is a 44-page book which provides all the information the players need for creating and maintaining an active character in a campaign. Character generation is covered in several easily understandable chapters. Characters have four attributes: Strength, Vigour, Dexterity and Ego. Each of these is rolled for on 3D6 and between 5-10 randomly generated superpowers which come from a list of 44 powers that are fully documented and explained in a chapter of their own. There is also an advantageous background chart which means that your character can start life as a millionaire, a playboy, a brilliant scientist, an industrialist, or even a god!

The supervisor's handbook is 84 pages long and contains much of the information already covered in the players' guide. Certain sections are more detailed but a lot appears to be duplicated. This book also contains chapters on the creation of thugs, animals, aliens, and other NPC's (non-player characters). There are also hints on how to create scenarios, campaigns, and maintain a consistent gaming world with the aid of a 16-page campaign guide. An average quality scenario is also provided in this book which also has a list of pre-generated heroes and villains, and involves a world peace keeping force called ICE (whose badge bears a strange resemblance to the Games Workshop logo), as well as a beautiful alien princess who is on the run from disgusting alien nasties.

The game itself is easy to understand and fairly easy to play. The combat system is reminiscent of *Advanced Dungeons & Dragons* (cross referencing attack levels with the target's armour class) but it does have special attacks such as parry, dodge, grapple, critical hits and misses.

The most interesting aspect of the game is the campaign section which gives characters 15 attributes that cover all the aspects of life as a hero, and helps to steer the game towards a campaign and more involved playing.

This game unlike most of its predecessors is not set in America. It uses England as its base country and has GP's (Golden Pounds) instead of Dollars for currency. The players, however, found it hard to come to terms with the fact that the game was set in England instead of America which they were accustomed to. This caused some culture shock and problems in our early games!

Golden Heroes is an interesting game but it does not have any original and outstanding features. Bearing this in mind as well as the fact that it is entering an already crowded market means that the easiest description of the game is, unfortunately, that it is average.

PC

Reviewers this issue:

PC Paul Christopher
WG Wendy Graham
GW Graham Williams

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CONVENTIONS

FANTASYCON X

The 10th Annual fantasy convention will be held on 6-8 Sept 1985 at the Royal Angus Hotel, Birmingham. The GoH is the fantasy and SF author Robert Holdstock.
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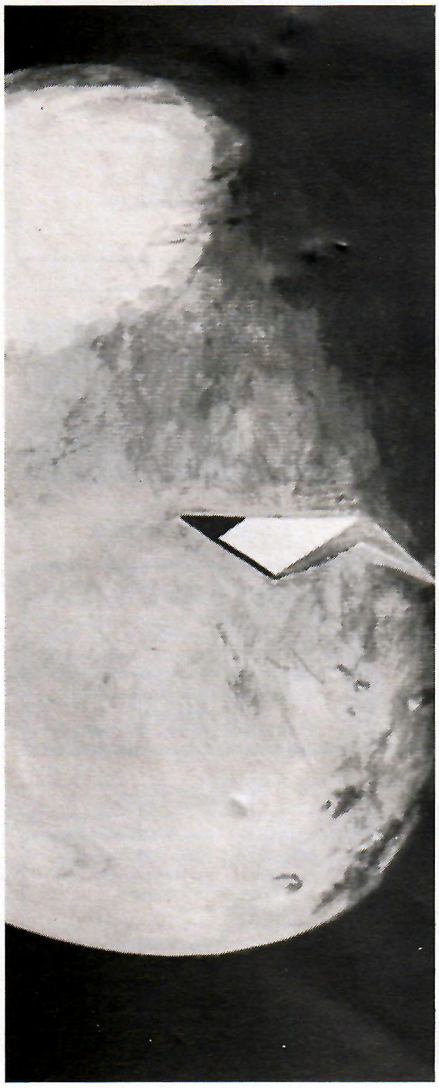
Waverider and NASA

This issue of *Space Voyager* contains Duncan Lunan's article about the potential of the Waverider re-entry vehicle, and mentions the planned launch of a test model in summer 1986. At the time of going to press ASTRA has obtained provisional permission for aerodynamic tests at Prestwick Airport, Scotland, of a Waverider model mounted on a car. These tests, scheduled for mid-March, are to provide data for finalising the design of the model for the rocket launch.

Meanwhile ASTRA's Waverider Aerodynamic Study Programme team has been invited to participate in a NASA design study, by designing a possible Waverider carrier vehicle for a future US space probe. More details will be announced as they become available.



A 'Caret Wing' Waverider approaches the Red Planet. Waverider craft can have a simple design, as shown here, and function well by riding on air-flow.

The chequered FLAG

A new club has been formed for fans of the TV series *Knight Rider.* Founder Sheila Jarvis started an unofficial club a short while ago, but was phoned on New Year's Day by David Hasselhoff himself from America who asked her if she would run his official club.

Sheila (who not surprisingly didn't believe it was him at first) naturally agreed and now FLAG offers four newsletters a year. Details from Sheila Jarvis at 21 Jackson Close, Bebington, Wirral, Merseyside. L63 8PB.

Merseyside meetings

Provisional dates for forthcoming meetings of the Merseyside Science Fiction Media Group ae May 17 and June 14 at the Shaftesbury Hotel, Mount Pleasant, from 7 pm. Details on the group from Roy Evans, 77 Selby Road, Orrell Park, Liverpool, L9 8EB.

The One Tun

Some readers may have heard – or over-heard – SF enthusiasts talking about 'the Tun' – well, it is a pub in London where SF folk of all persuasions foregather on the first Thursday of every month.

The pub – the One Tun – is on Saffron Hill, just opposite Farringdon Tube station, and it has been known for famous faces to drop in on those certain Thursdays.

Bumper issue

Empathy, the *Star Trek* group has surpassed itself with a 100 page issue of their newsletter, which clunked through the Editor's letter box recently. The newsletter, always one of the largest around, usually features news, contacts, adverts, letters, debate, fiction and reviews.

For details Carol Keogh, 45 Welby House, Hazellville Road, London N19.

Writers at meetings

The Birmingham SF group meets each month at the New Imperial Hotel, Temple Street, Birmingham, on the third Friday of each month.

On May 17 Maxim Jakuboski, SF editor and translator will be guest speaker, followed by Ramsey Campbell on June 21. For the March meeting the Group was due to have Frank Herbert speaking and in April they were expecting Brian Aldiss.

Membership details from our own Roger Peyton at his Andromeda Bookshop in Birmingham.

NEXT ISSUE

Anne McCaffrey

The lady with the Dragons who is anything but herself talks at length with Wendy Graham.

Gerry Anderson

Part three brings us up to date on Gerry Anderson's career as David Nightingale follows the production history of the master of SF puppetry.

Lord Young of Argo

What is the Argo Venture? Why is a Peer of the Realm interested in a settlement on Mars? Andy Nimmo supplies the answers.

Long Distance

In this issue Patrick Moore told us all about Halley's comet. Now he'll tell us how we can best see it, by discussing the pros and cons for telescopes and binoculars available to the average reader.

Nyssa of Traken

Sarah Sutton looks back on her times travelling with Doctor Peter Davison, and on the rest of her career.

Letter from Hollywood

Randy and Jean-Marc report on the latest from Tinsel Town.

And More!!!

All the regular features – your letters, your news, Data Bank, Book and film reviews, the latest on the Shuttle, Night Sky maps, product reviews, modelling reports and scratchbuilding instructions plus as much more as we can shoehorn in (we're getting very good at sitting on the editorial equivalent of a suitcase!) will be on sale as *Space Voyager* 16 on July 12.

If you have problems getting hold of *Space Voyager,* let us know and we'll try to help out.

POLICE

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